

The impact of allergic rhinitis on sexual activity, sleep, and fatigue

Michael S. Benninger, M.D.,¹ and Ryan M. Benninger²

ABSTRACT

Allergic rhinitis (AR) has been found to impact the daily activities of allergic patients. This includes the effects on sleep and chronic fatigue. The effect of AR on sexual function has not been well studied. The purpose of this study was to assess the impact of AR on sexual function, sleep, and fatigue. The Rhinosinusitis Disability Index (RSDI) is a quality of life (QOL), validated outcomes tool that assesses how AR affects QOL. Specific questions address the adverse consequence on sexual function, sleep, and fatigue. Four subsets of patient with AR who completed the RSDI were evaluated for the specific questions as well as the physical, emotional, functional, and total scores. The scores were compared with a cohort of normal subjects, patients with a diffuse group of rhinologic disorders, and patients scheduled for septal surgery (non-AR patients). Patients with AR had significantly higher (worse) sexual and sleep RSDI scores than the non-AR patients and normal subjects. Although the AR subjects also had significantly higher fatigue RSDI scores than the normal subjects, there was no significant difference between the AR and non-AR patients' fatigue scores. Non-AR patients had significantly higher sexual, sleep, and fatigue RSDI scores than the normal subjects. AR has a significant negative impact on sexual function and can result in sleep disturbances and fatigue as measured by the RSDI.

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Key words: Allergic rhinitis, allergies, fatigue, outcomes, quality of life, sexual function, sleep

Allergic rhinitis (AR) is a common disorder affecting 10–40% of the population.¹ A number of studies have shown that AR results in a negative impact of overall quality of life (QOL). There is also growing evidence that incidence may be increasing.² Given this high prevalence and the significant impact on QOL, AR has been classified as a major chronic respiratory disease.³ AR is commonly associated with symptoms of nasal congestion, sneezing, nasal itching, and anterior and posterior rhinorrhea. There is growing evidence that the impact of AR is more substantive than the localized symptoms. Allergy severity has been shown to have a direct correlation with decreased work productivity affecting people's ability to concentrate at work, working without mistakes, and the ability to handle the workload.⁴ AR appears to have a substantive effect on sleep and can result in fatigue and daytime somnolence.⁵ The nasal congestion impact of

AR has been shown to impact a number of aspects of sleep including preventing falling asleep, difficulty falling asleep, and waking people at night.^{6,7} Similar findings have been noted in adolescent children, aged 12–17 years in whom it has been shown they have difficulty falling asleep, wake up during the night, and are unable to get a good night's sleep.⁸ The impact of AR on sleep seems to also have an effect on daily function in children because children with rhinitis and snoring have been shown to have poorer school performance compared with controls.^{9,10}

The role of AR in chronic fatigue has also been described but this relationship remains controversial.¹¹ Despite this, AR has been shown to have a substantial impact on workplace productivity with AR patients having decreased ability to concentrate at work, handle the workload, and work without mistakes.⁴ These impacts on workforce productivity worsened with worsening allergy severity.⁴

AR has been found to have a substantial impact on patient perception of QOL. As in many disorders, measuring patient perception of QOL has served as a method to assess the impact of disease and treatment both in the real world setting and also for assessing the response to treatment.¹² The symptoms of AR can have a negative effect on the physical, psychological, and social aspects of patients' lives.^{13–16} A number of validated outcomes instruments have been developed to assess the impact of AR on many of these health quality and outcomes parameters. Probably, the first and

From the ¹Head and Neck Institute, The Cleveland Clinic, Cleveland, Ohio, and ²undergraduate at Miami University, Oxford, Ohio

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Address correspondence and reprint requests to Michael S. Benninger, M.D., Head and Neck Institute, The Cleveland Clinic, 9500 Euclid Avenue, Cleveland, OH 44195

E-mail address: Benningm@ccf.org

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most commonly used instrument is the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ).¹⁵ The RQLQ measures the effect of AR on seven different domains of function assessing the impact on activities, sleep, miscellaneous symptoms, practical problems, nose symptoms, eye symptoms, and emotions.¹⁵ More recently, a separate variation of the RQLQ has been developed to more specifically assess the effect of AR on a number of different symptoms related to sleep.¹⁷

The Rhinosinusitis Disability Index (RSDI) is a broader instrument that has been validated to measure the impact of a number of different rhinologic conditions, including AR, on a patient's perception of QOL. The RSDI is a 30-item instrument that measures the overall QOL impact as well as the effects on three different domains of health, which include physical (9 questions), functional (11 questions), and emotional (10 questions).^{13,14} The RSDI has been used *via* the Internet to assess patient perception of QOL and the impact of sinonasal disease. It has been shown that QOL can be self-assessed using an Internet-based, validated outcomes tool. The results of this evaluation are similar between Internet website users and published scores.¹⁸ Patients answer the 30 questions of the RSDI based on a five-point scale of 0, never; 1, almost never; 2, sometimes; 3, almost always; and 4, always. The scores are added to determine the subscale scores and total score with a theoretical range of 0, best, to 120, worst.¹³

Because there has been a growing interest in assessing the impact of AR on QOL parameters other than specific nasal and ocular symptoms, there has been mounting interest in evaluating the impact of AR on sleep and fatigue. The RSDI has one question that is part of the physical domain that asks, "Because of my problem I don't sleep well." and another question in the functional domain that asks, "Because of my problem I feel fatigued."¹³

One important and largely overlooked aspect of the overall QOL impact of a disease is how it affects sexual function. Kirmaz *et al.* assessed the impact of AR on sexual dysfunction in 43 sexually active AR patients and compared them with a group of non-AR controls before and after treatment with desloratadine. They noted that the AR had worse scores on the Female Sexual Function Index and the International Index of Erectile Dysfunction than the controls. Furthermore, the scores of both scales improved after desloratadine treatment.¹⁹ Despite the substantial interest in measuring a number of different QOL factors of AR, other than the one study noted previously¹⁹ there has been little discussion on the effect of AR on sexual function. Because the RSDI also addresses the effect on sexual function as part of the physical domain with the question, "My sexual activity is affected by my problem," it is a useful tool to evaluate the influence of nasal disorders, including AR, on the patient's perception of

sexual dysfunction. The purpose of this study was to assess the impact of AR on the sexual activity, sleep, and fatigue of patients using the RSDI.

METHODS

After obtaining Institutional Review Board approval, information was obtained from four subsets of patients: the initial cohort of patients used in the original validation of the RSDI,¹³ patients used to evaluate the usefulness of the RSDI in rhinologic disorders,¹⁴ patients that completed the RSDI on the Internet,¹⁸ and a prospective sequential group of newly diagnosed and untreated AR patients in a rhinology practice. The patients in the validation study,¹³ the usefulness study,¹⁴ and the prospective group were untreated at the time that they completed the RSDI. The non-AR rhinologic patients in the validation study¹³ and the usefulness study¹⁴ include a diffuse group of rhinologic patients including those with non-AR, chronic rhinosinusitis (CRS) with or without polyps, aspirin hypersensitive patients, and patients with nasal obstructive disorders such as septal deviations. The Internet population was based on patient self-identification as having AR, although those results were "consistent with previous surveys conducted by means other than the Internet."¹⁸ Six Internet study patients were removed from the final analysis because either their sex or their age was not identified. AR was confirmed by history and allergy testing (*in vivo* or *in vitro*) in the validation,¹³ usefulness,¹⁴ and the new patient cohort. It is not known if the Internet population¹⁸ had any confirmation of their diagnosis or whether or not they had been treated for their AR.

Patients with CRS, including those with polyps and aspirin sensitivity triad, were broken out from the studies for an observational comparison. Because all the individual scores could not be obtained from this group, however, statistical assessment of the QOL impact of CRS was not made in comparison with the other rhinologic conditions or the normal controls.

The scores for the questions regarding sexual function, sleep, and fatigue were independently evaluated. The functional, emotional, and physical subscales and total RSDI scores were also assessed. In an effort to identify the specific impact of AR on sexual function, sleep, and fatigue, four comparative groups were also identified: the normal control subjects from the initial validation,¹³ non-AR patients from the validation study,¹³ non-AR rhinitis patients from the usefulness study,¹⁴ and a subset of consecutive non-AR patients who completed the RSDI before undergoing septal surgery.²⁰

All patients self-administered the RSDI and all subjects answered the three study questions. The functional, emotional, and physical domains were calculated and if there were missing data points for other

Table 1 Population by cohort

	Subject No.	Sex	Average Age (yr)
AR subjects: Validation study ¹³	16	9 F/7 M	42
AR subjects: Usefulness study ¹⁴	43	29 F/14 M	39
AR subjects: Prospective untreated	50	32 F/18 M	38
AR subjects: Internet survey study ¹⁸	211	130 F/81 M	41
Non-AR subjects: Validation study ¹³	71	40 F/31 M	45
Non-AR subjects: Usefulness study ¹⁴	249	129 F/120 M	46
Non-AR subjects: Septal surgery study ²⁰	12	5 F/7 M	44
Normal subjects: Validation study ¹³	44	24 F/20 M	43
CRS subjects: Usefulness study ¹⁴	131	74 F/57 M	45

AR = allergic rhinitis; CRS = chronic rhinosinusitis.

Table 2 Mean (SD) Rhinosinusitis Disability Index (RSDI) scores by cohort

	No. of Subjects	Sexual	Fatigue	Sleep	F	E	P	Total
AR: Validation ¹³	16	1.75 (0.93)	1.13 (0.81)	2.56 (1.09)	15.8	14.8	18.2	48.8
AR: Usefulness ¹⁴	43	1.72 (1.03)	1.26 (1.09)	2.35 (1.00)	16.5	16.3	18.1	50.9
AR: Prospective	50	1.82 (1.06)	1.30 (0.93)	2.44 (0.84)	16.9	16.2	19.3	52.4
Total diagnosed AR	109	1.77	1.27	2.52	16.3	16.0	18.7	51.0
AR: Internet ¹⁸	211	1.53 (1.06)	1.13 (1.04)	2.42 (0.89)	15.9	15.7	18.8	50.4
Total AR patients	320	1.61	1.18	2.41	16.1	15.8	18.8	50.7
Non-AR: Validation ¹³	71	0.82 (1.02)	1.34 (0.91)	2.01 (1.06)	13.2	12.1	17.2	42.5
Non-AR: Usefulness ¹⁴	249	0.77 (0.89)	1.01 (0.96)	1.91 (1.13)	12.3	11.2	16.1	39.6
Non-AR: Septal surgery ²⁰	12	0.67 (0.78)	1.08 (0.90)	2.00 (0.95)	12.6	9.7	16.8	39.0
Total non-AR patients	332	0.76	1.08	1.94	12.5	11.3	16.4	40.2
Normals: Validation ¹³	44	0.20 (0.46)	0.48 (0.76)	0.55 (0.70)	2.61	2.51	2.89	8.01
CRS: Usefulness ¹⁴	131	1.48	1.18	2.25	16.5	14.7	18.5	49.7

F = functional RSDI subscale; E = emotional RSDI subscale; P = physical RSDI subscale; total = RSDI total score; AR = allergic rhinitis; CRS = chronic rhinosinusitis.

unanswered questions of the RSDI, these items were calculated as 0, never. Total scores were calculated from the totals of the functional, emotional, and physical subscales.

STATISTICAL ASSESSMENT

Data

Data were obtained from four subsets of patients: the initial cohort of patients used in the original validation of the RSDI, patients used to evaluate the usefulness of the RSDI in rhinologic disorders, patients that completed the RSDI on the Internet, and a prospective sequential group of newly diagnosed and untreated AR patients in a rhinology practice. In an effort to identify the specific impact of AR on sexual function, sleep, and fatigue, three groups of patients were formed for comparisons (see Table 1): (1) 320 AR patients (16 from the validation study, 43 from the usefulness study, 211 from the Internet study, and 50 from

the prospective group; (2) 44 normal subjects from the validation study; (3) 337 non-AR rhinologic patients (71 from the validation study, 254 from the usefulness study, and 12 from a subset of consecutive non-AR patients who completed the RSDI before undergoing septal surgery). The means and standard deviations for the sexual, sleep, and fatigue items as well as the RSDI subscale and total scores are noted in Table 2.

Because the subjects in the Internet study may not have had a formal diagnosis of AR and therefore may have biased the results, the analysis was repeated using only subjects from the validation study, the usefulness study, and from the prospective group. One hundred nine subjects comprised the non-Internet AR population for comparison.

Statistical Method

Sexual function, sleep, and fatigue scales were described using mean, median interquartile range be-

Table 3 Group comparison including the internet allergic rhinitis (AR) subjects

Group	n	Mean	Median (IQR)	Overall p Value
Sexual				<0.001
AR patients	320	1.60	2.0 (1.00, 2.0)*#	
Non-AR patients	337	0.77	1.00 (0.00, 1.00)§	
Normal subjects	44	0.20	0.00 (0.00, 0.00)	
Sleep				<0.001
AR patients	320	2.42	2.0 (2.0, 3.0)*#	
Non-AR patients	337	1.93	2.0 (1.00, 3.0)§	
Normal subjects	44	0.55	0.00 (0.00, 1.00)	
Fatigue				<0.001
AR patients	320	1.17	1.00 (0.00, 2.0)#	
Non-AR patients	337	1.08	1.00 (0.00, 2.0)§	
Normal subjects	44	0.48	0.00 (0.00, 1.00)	

*AR patients had significantly higher scores than non-AR patients ($p < 0.001$).

#AR patients had significantly higher scores than normal subjects ($p < 0.001$).

§Non-AR patients had significantly higher scores than normal subjects ($p < 0.001$).

IQR = interquartile range between 25 percentile and 75 percentile.

tween 25 percentile and 75 percentile, frequencies and percents. Because the data were ordinally scaled, non-parametric methods were used for analysis. A Kruskal-Wallis test was used for an overall comparison for sexual function, sleep, and fatigue, respectively, among the three groups. If the overall comparison showed a significant result, then Steel-Dwass pairwise comparisons were performed to find which groups differ. All tests were two sided. Unless otherwise defined, all analyses were performed at a significance level of 0.05. All analyses were performed using SAS 9.1 software (SAS Institute, Inc., Cary, NC).

The three groups were formed from combining patients from different studies, as described in the data section. For example, the AR group was formed by combining the AR patients from the validation study, the usefulness study, the Internet study, and the prospective group, with a separate AR analysis using subjects from the validation study, the usefulness study, and the prospective group. The analysis assumed that the characteristics of patients from different studies were similar to each other when forming a comparative group.

RESULTS

Table 2 provides the summary statistics for subgroups. Table 2 shows that mean scores for sexual, sleep, and fatigue from different studies do not differ very much from each other.

Table 3 provides the comparisons for sexual function, sleep, and fatigue between the total AR patients, total non-AR patients, and the normal subjects from the validation study. Also, the mean and median (interquartile range) were provided. The Kruskal-Wallis

tests showed that there were significant differences in sexual function ($p < 0.001$), sleep ($p < 0.001$), and fatigue ($p < 0.001$) among the three groups. The pairwise comparisons showed that the AR patients had significantly higher sexual function scores than the other two groups (non-AR and normal subjects), with both p values being <0.001 . Also, the non-AR patients had significantly higher sexual scores than the normal subjects ($p < 0.001$). The pairwise comparisons for the sleep scores showed that the AR patients had significantly higher sleep scores than the other two groups, with both p values being <0.001 . Also, the non-AR patients had significantly higher sleep scores than the normal subjects ($p < 0.001$). The pairwise comparisons for the fatigue showed that the AR patients and non-AR patients tended to have significantly higher fatigue scores than the normal subjects, with both p values being <0.001 . However, no significant difference in fatigue was found between the AR patients and non-AR patients ($p = 0.44$).

Table 4 provides the comparisons for sexual function, sleep, and fatigue between the total AR patients without the Internet subjects, total non-AR patients, and the normal subjects from the validation study. The pairwise comparisons showed that the AR patients had significantly higher sexual function scores than the other two groups, with both p values being <0.001 . Also, the non-AR patients had significantly higher sexual scores than the normal subjects ($p < 0.001$). The pairwise comparisons for the sleep scores showed that the AR patients had significantly higher scores than the other two groups, with both p values being <0.001 . Also, the non-AR patients had significantly higher sleep scores than the normal subjects ($p < 0.001$). The

Table 4 Group comparison excluding the Internet allergic rhinitis (AR) subjects

Group	n	Mean (SD)	Median (IQR)	Overall p Value
Sexual				<0.001
AR patients	109	1.77 (1.02)	2.0 (1.00, 2.0)*#	
Non-AR patients	337	0.77 (0.91)	1.00 (0.00, 1.00)§	
Normal subjects	44	0.20 (0.46)	0.00 (0.00, 0.00)	
Sleep				<0.001
AR patients	109	2.42 (0.94)	2.0 (2.0, 3.0)*#	
Non-AR patients	337	1.93 (1.10)	2.0 (1.00, 3.0)§	
Normal subjects	44	0.55 (0.70)	0.00 (0.00, 1.00)	
Fatigue				<0.001
AR patients	109	1.26 (0.98)	1.00 (0.00, 2.0)#¶	
Non-AR patients	337	1.08 (0.95)	1.00 (0.00, 2.0)§	
Normal subjects	44	0.48 (0.76)	0.00 (0.00, 1.00)	

*AR patients had significantly higher scores than non-AR patients ($p < 0.001$).

#AR patients had significantly higher scores than normal subjects ($p < 0.001$).

§Non-AR patients had significantly higher scores than normal subjects ($p < 0.001$).

¶No significant difference in scores between AR patients and Non-AR patients ($p = 0.14$).

IQR = interquartile range between 25 percentile and 75 percentile.

pairwise comparisons for the fatigue showed that the AR patients and non-AR patients had significantly higher fatigue scores than the normal subjects, with both p values being <0.001 . However, no significant difference in fatigue was found between the AR patients and non-AR patients ($p = 0.14$).

The reanalysis after excluding the Internet study patients showed the similar results as the previous analysis with Internet study included. Both had similar significant findings for the comparisons among AR, non-AR, and normal groups at a two-sided significant level of 0.05.

Table 5 shows the frequency and percent of responses for each group including the Internet study. Table 5 shows that, for sexual function, the percentage of "almost always" (12.8%) or "always" (4.4%) for the AR patients was higher than the other two groups. Similarly, for sleep function, the percentage of "almost always" (30.3%) or "always" (12.2%) for the AR patients was higher than the other two groups. For sleep, the percentage of "almost always" (5.3%) or "always" (2.2%) for the AR patients was higher than the normal group, while not much difference was observed between the AR and non-AR groups. It was noticed that, for normal patients, no patients had answers of "almost always" or "always" for all of the three study questions.

Figures 1–3 are bar plots for sexual function, sleep, and fatigue by group. The y -axis is in the percent scale. Each vertical bar represented the percentage for the number of subject at a score level of the group total.

In the total cohort of AR patients 17.2% of respondents almost always or always state that, "My sexual

activity is affected by my problem," in contrast to 5.2% of the non-AR patients and none of the normal subjects. Forty-two percent of the AR patients answered "almost always" or "always" for the question, "Because of my problem I don't sleep well," in comparison to 31.1% of the non-AR patients and none of the normal subjects. Only 17.2% of the AR patients reported that it "never" affects their sexual activity, while only 3.45% of AR patients "never" have problems sleeping (Table 4).

When those subjects who have recorded a 0 (never) are removed, the mean score in the validation study for sexual dysfunction is 2.0, for sleep disturbances is 2.7, and for fatigue is 1.5.¹³ The mean score in the usefulness study for sexual dysfunction is 2.0, for sleep disturbances is 2.4, and for fatigue is 1.86.¹⁴ In the Internet study, when the people that answered with a 0 (never) were removed, the mean score for sexual dysfunction was 1.95, for sleep disturbance is 2.5, and for fatigue is 1.62.¹⁸ In the prospective evaluation, the mean score for sexual dysfunction is 2.2, for sleep disturbance is 2.7, and for fatigue is 1.6.

When CRS patients with or without polyps are looked at separately from the non-AR rhinologic patients, higher scores are noted than from the entire non-AR rhinologic group (See Table 2). In the validation study,¹⁴ the sexual activity score is 1.48, fatigue is 1.18, and sleep is 2.25.

DISCUSSION

AR has a substantial impact on QOL. This can occur in a variety of daily activities from productivity to

Table 5 Frequency and percent of responses

Variable and Level	AR Patients			Non-AR Patients		Normal Subjects	
	Total	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Sexual							
Never	250	55	17.2	159	47.2	36	81.8
Almost never	210	86	26.9	117	34.7	7	15.9
Sometimes	169	124	38.8	44	13.1	1	2.3
Almost always	53	41	12.8	12	3.6	0	0
Always	19	14	4.4	5	1.5	0	0
Sleep							
Never	78	11	3.4	42	12.5	25	56.8
Almost never	100	19	5.9	67	19.9	14	31.8
Sometimes	282	154	48.1	123	36.5	5	11.4
Almost always	178	97	30.3	81	24	0	0
Always	63	39	12.2	24	7.1	0	0
Fatigue							
Never	237	104	32.5	103	30.6	30	68.2
Almost never	231	88	27.5	136	40.4	7	15.9
Sometimes	182	104	32.5	71	21.1	7	15.9
Almost always	39	17	5.3	22	6.5	0	0
Always	12	7	2.2	5	1.5	0	0

AR = allergic rhinitis.

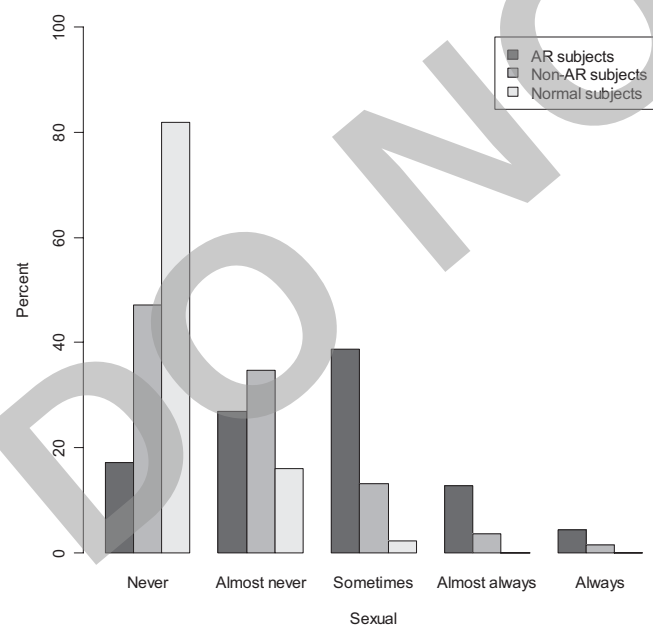


Figure 1. Frequency of answers for the sexual function question of the Rhinosinusitis Disability Index (RSDI). AR = allergic rhinitis.

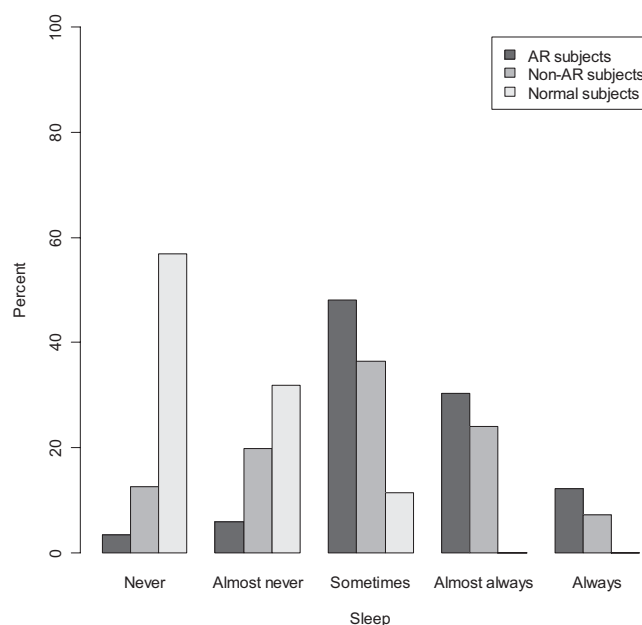


Figure 2. Frequency of answers for the sleep question of the Rhinosinusitis Disability Index (RSDI). AR = allergic rhinitis.

problems with sleep and fatigue. A number of studies have explored the impact of AR on sleep in both adults and children.^{4,7,8,11,21} Many AR patients also complain of chronic fatigue and there is growing discussion of both increased absenteeism and presenteeism, where the individuals will go to work but their productivity is dramatically decreased.^{4,22} All of these factors play a

role in QOL. The current data would support the impact of AR on sleep and to a lesser extent on fatigue. Forty-two percent of patients in this study feel that their sleep is almost always or always affected by their AR and only 3.4% feel that it never affects their sleep. Based on the RSDI, however, it also appears that patients with AR are more significantly impacted by AR

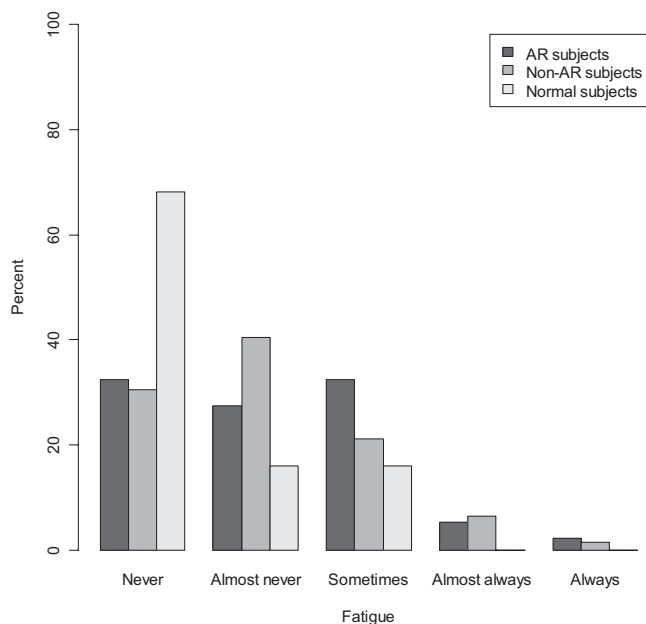


Figure 3. Frequency of answers for the fatigue question of the Rhinosinusitis Disability Index (RSDI). AR = allergic rhinitis.

than other rhinologic conditions, which together include non-AR, nasal anatomic obstruction, polyps, or CRS. AR patients also describe more fatigue than normal subjects but not more than patients with other rhinologic conditions.

Although it can be speculated that AR may play a role in negatively impacting sexual activity, this has rarely been explored in detail.¹⁹ This study uses a validated QOL instrument that includes a question about sexual activity. Although the RSDI is evaluated based on total score and its three subscales, each question was individually evaluated in the validation process and each serves as its own control in the current study. This question regarding sexual activity was significant in the original validation study.¹³ Although it is a single question and it does not give enough detail to identify the specific affect on sexual activity, this study does suggest that this may be a more significant problem for AR patients than has been identified before. In the entire group of AR patients, only 17% of people stated that their AR never affects their sexual function while another 17% feel that it almost always or always has an affect. Given the significant nature of this impact, it may be reasonable to develop further methods to assess how AR may lead to alterations in sexual activity.

An interesting finding is that the AR patients were much more likely to answer the sexual activity question with higher scores than the general non-AR rhinologic patients, although the scores are closer between the two groups in relationship to sleep and fatigue. The same can be seen to be true when compared directly with the septal deviation patients. This

might suggest that the effect on sexual activity may be caused by, in part, factors other than nasal obstruction. Nasal obstruction alone, however, can have an impact on sleep²³ and subsequently lead to fatigue. Because the non-AR subjects were derived from earlier studies it is possible, although not likely, that the questions may have been answered differently at a later date.

How might AR impact sexual function? There could potentially be a direct impact on the sense of "sexiness" or affect the sexual activity itself. It can be speculated that the chronic obstruction, runny nose, sneezing, and decreased smell may all result in impacting the satisfaction of sexual activity. Even the simple act of kissing may be altered by these symptoms. Many people may not feel "sexy" or may actually be embarrassed by their symptoms so that they would avoid intimate contact. Kirmaz *et al.*, using the International Index of Erectile Dysfunction, which has five domains (erectile function, intercourse satisfaction, orgasmic function, sexual desire, and overall satisfaction) that assess erectile dysfunction, noted that men with AR had lower scores than control subjects. Similarly, the women with AR also had lower scores than controls when they completed the Female Sexual Function Index, which has six domains (desire, subjective arousal, lubrication, orgasm, satisfaction, and pain).¹⁹ It can also be speculated that other impacts on sleep, concentration, and fatigue may affect the desire for intimacy and sexual contact. Many untreated AR patients may find that their daily activities related to their job and family may stretch their functionality to the point where sexual activity becomes secondary.

These types of symptoms might also be expected with CRS with/without polyps. This would appear to be true based on the evaluations of CRS patients, where the scores are also elevated in comparison with normal or non-AR patients. They also have rhinorrhea, decreased smell, and nasal congestion. They may experience problems with their sleep and have some chronic fatigue that may affect sexual activity. These symptoms in AR and CRS patients would be distinguished from the septal deviation or anatomic deviation patients. These patients would have obstruction but would not be expected to have nasal obstruction but not the rhinorrhea, decreased smell, and sneezing. The non-AR patients tend not to have as much sneezing or change in smell and their symptoms overall may be less intense than the AR or CRS patients.

A large percentage of the patients with AR were from the Internet survey¹⁸ and it is possible that they do not represent a true AR population. In that study, the findings suggested that those that completed the surveys replied similarly to how they are answered by patients formally diagnosed with AR. The secondary analysis excluding the Internet subjects showed similar results as the previous analysis with the Internet study

included. Surveys are widely used to try to understand the effect of AR on QOL but are limited by the inability to determine an accurate diagnosis. Nonetheless, such surveys of self-reported AR are useful in understanding prevalence rates and various aspects of care delivery processes and patient satisfaction with treatment.²⁴

The study by Kirmaz *et al.* not only showed that patients with AR had worse scores on the Female Sexual Function Index and the International Index of Erectile Dysfunction than the controls, they also showed that the scores of both scales improved after antihistamine treatment.¹⁹ It has been shown in a randomized clinical trial of asthmatic women versus controls that those women in a well-controlled environment of self-regulation and interventions had greater recognition of asthma symptoms during the menstrual cycle and had decreased asthma symptoms with sexual activity.²⁵ Such studies would suggest that treatment of patients with AR may improve their sexual activity. One potential variable that might have been interesting to assess would have been to evaluate if there were differences in response based on the sex of the subject. The current study could not be stratified by the sex of the subject because they were not identified in each group.

In conclusion, AR has an important impact on QOL. One of the as yet poorly recognized consequences of AR is on the sexual function of the patient. Using the RSDI, this study shows that sexual activity is negatively impacted in AR patients in relationship to control subjects and non-AR rhinologic patients. A consideration of these potential effects on sexual function should probably be considered in AR patients. As treatments for AR are evaluated, the effectiveness of these therapies on sexual function may be an important measurement.

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