Original Article
The interactive correlation of pain, negative emotion, insomnia and quality of life in Allergic Rhinitis patients

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Abstract: Objective: To investigate the pain characteristics, physiological and psychological symptoms, as well as quality of life (QOL) in Allergic Rhinitis (AR) patients suffering from chronic pain and to analyze the influential factors on QOL. Methods: 122 AR patients and 102 normal subjects were participated in this study. The pain characteristics, QOL, depression, anxiety and insomnia were evaluated respectively. All the data were put into statistical software and t-test was used to analyze the difference. Pearson correlation analysis, multiple linear stepwise regression analysis and path analysis were used in the data analysis. Results: SF-MPQ total score, sensory pain sub-score, and the emotional pain sub-score were positively correlated with BDI, BAI, AIS total scores in the patient group. Furthermore, there existed a statically significant negative correlation between SF-12 subsets and characteristic of pain, depression, anxiety, insomnia in the cancer pain patients. Conclusion: The depression, anxiety and insomnia of the AR patients were significantly in higher levels than that of the normal population and thereby their QOL was also lower than the control group. Depression and anxiety were the most obvious influential factors affected the QOL of the AR patients.

Keywords: Allergic Rhinitis (AR), pain, quality of life, depression, anxiety, insomnia

Introduction

Allergic Rhinitis (AR) is inflammation of the nasal mucous membranes that can lead to symptoms such as sneezing, nasal congestion, nasal itching, postnasal drainage, and rhinorrhea. Although AR is not a life-threatening condition, morbidity from the condition can seriously impair quality of life and increase health-care cost [2]. It has been suggested that patients with chronic AR had a health status similar to that of patients with arthritis, cancer, asthma, and inflammatory bowel disease. In addition, chronic AR was found to be significantly associated with increased depression and visits to mental-health professionals [3]. AR impairs quality of life, sleep and social activities [2, 4]. Poor sleep quality may induce diurnal somnolence. Impact is correlated with the severity of symptoms.

AR can produce many different symptoms, some subtle and some not at all subtle [7]. There are many factors leading to changes of QOL for AR patients, including the factor of pain itself, and other factors related to age, gender, education, economic status, physical diseases, such as stroke, heart failure, Parkinson's disease, etc, while mental factors as abnormal emotions will also affect QOL of the AR patients [14].

In recent years, there are more and more studies on factors affecting QOL of AR patients conducted by domestic and foreign scholars [15-17], but several problems are still confusing as follows: Firstly, quite a few scholars have investigated the relationship between QOL and AR symptoms themselves, but most of them focused their studies on how the intensity of those symptoms affected QOL, thus, the relationship between AR and QOL was not sufficiently comprehensively analyzed. Secondly, many scholars have investigated impacts of depression, anxiety, insomnia on life quality of patient with AR separately, but failed to comprehensively evaluate these factors and AR in the same study and jointly analyze their impacts on life quality. We therefore in this study investigated the correlation among various factors

affecting life quality of AR patients and provided the theoretical basis for clinical treatment about psycho-oncology.

Material and methods

Study objects

122 patients from outpatients and inpatients diagnosed with AR were randomly selected from January 2012-July 2014; 102 normal controls from population at outpatient service who visited our hospital for physical examination were randomly selected.

Scales used in the study

The investigation scales used in the study included general information questionnaire, short-form of McGill pain questionnaire (SF-MPQ), short-form questionnaire on health-related QOL (SF-12), Beck depression inventory (BDI), Beck anxiety inventory (BAI), Athens insomnia scale (AIS).

General information questionnaire

General information questionnaire designed by the investigators was used, of which the contents including: age, gender, urban or rural area, marriage, education level, monthly income, past history, etc.

Short-form of McGill pain questionnaire (SF-MPQ)

A short form of the McGill Pain Questionnaire (SF-MPQ) has been developed. The main component of the SF-MPQ consists of 15 descriptors (11 sensory; 4 affective) which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate or 3 = severe. Three pain scores are derived from the sum of the intensity rank values of the words chosen for sensory, affective and total descriptors. The SF-MPQ also includes the Present Pain Intensity (PPI) index of the standard MPQ and a visual analogue scale (VAS). The SF-MPQ scores obtained from patients in post-surgical and obstetrical wards and physiotherapy and dental departments were compared to the scores obtained with the standard MPQ. The correlations were consistently high and significant. The SF-MPQ was also shown to be sufficiently sensitive to demonstrate differences due to treatment at statis-tical levels comparable to those obtained with the standard form.

Short-form questionnaire on health-related QOL (SF-12)

The 12-item Short Form Health Survey (SF-12) is a shorter alternative of the SF-36 instrument that includes 12 questions and 8 scales: physical functioning (PF-2 items on limitations doing moderate activities and climbing several flights of stairs), role limitations due to physical problems (RP-2 items on less accomplishment than one would like to achieve and limitation in kind of work or other activities), bodily pain (BP-1 item on pain interference with one's normal work), general health (GH-1 item on general health perception), vitality (VT-1 item on having energy), social functioning (SF-1 item on interference of physical health or emotional problems with one's social activities), role limitations due to emotional problems (RE-2 items on less accomplishment than one would like to achieve and not being careful in doing activities as usual) and perceived mental health (MH-2 items on feeling calm or peaceful and feeling sad or blue). Response categories for items vary from 2- to 6-point scales and raw scores for items are ranging from 1 to 6. After recoding raw scores for some items (that are BP, GH, VT, and one item from MH); then the raw scores could be transformed in order to provide eight scale scores each ranging from 0 (the worst) to 100 (the best). This method of scoring (summated ratings) assumes that item or items belonging to each scale can be transformed or summed without standardization of scores or item weighting.

Beck depression inventory (BDI)

The Beck Depression Inventory (BDI) is a 21-question multiple-choice self-report inventory, one of the most widely used instruments for measuring the severity of depression. Its development marked a shift among health care professionals, who had until then viewed depression from a psychodynamic perspective, instead of it being rooted in the patient's own thoughts. The questionnaire is designed for individuals aged 13 and over, and is composed of items relating to symptoms of depression such as hopelessness and irritability, cognitions such as guilt or feelings of being punished, as well as physical symptoms such as fatigue,
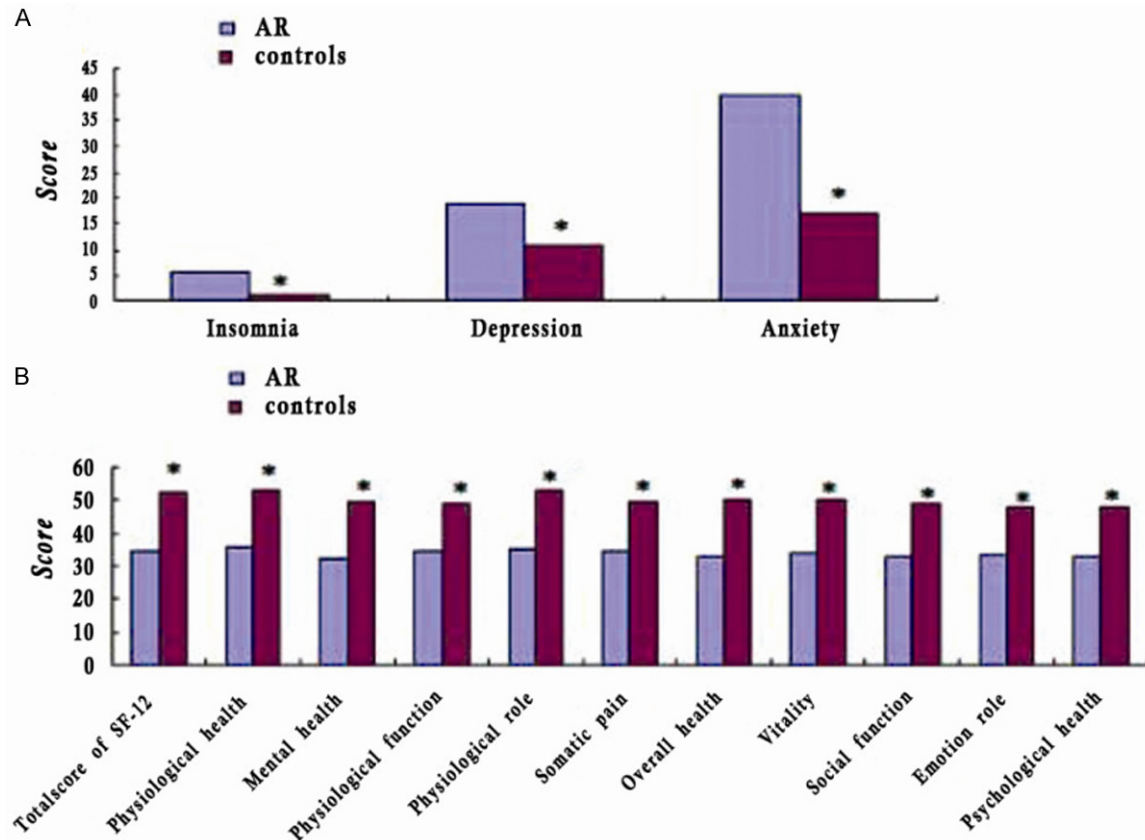
Figure 1. The SF-12 on the negative emotions on the AR patients. A. Compared with the control group, the patients group was more likely to be in depression [65 (63.7%) versus 13 (10.7%), respectively, X^2 = -37.341, P<0.001]. BDI total score was higher in the patients group than in the control group (t = -7.672, P<0.001); Compared to the control group, the patients group was more likely to be anxiety [27 (26.5%) versus 7 (5.7%), respectively, X^2 = -5.213, P<0.001]. BAI total score was higher in the patients group than that in the control group (t = -8.626, P<0.001). (5) Compared to the control group, the patients group was more likely to be insomnia [87 (85.3%) versus 29 (23.8%), respectively, X^2 = -9.712, P<0.05]. AIS total score was higher in the patients group than that in the control group t = -14.724, P<0.001). B. SF-12 total score was lower in the patients group than that in the control group (t = 12.291, P<0.001). All eight SF-12 sub-scores, including Physical functioning (PF), role- Physical (RP), bodily Pain (BP), general health (GH), vitality (VT), social functioning (SF), role-Emotional (RE) and mental health (MH) were significantly lower in the patients group compared with the control group (P<0.05).

weight loss, and lack of interest in sex. It consists of twenty-one questions about how the subject has been feeling in the last week. Each question has a set of at least four possible answer choices, ranging in intensity. For example: (0) I do not feel sad, (1) I feel sad, (2) I am sad all the time and I can't snap out of it, (3) I am so sad or unhappy that I can't stand it. When the test is scored, a value of 0 to 3 is assigned for each answer and then the total score is compared to a key to determine the depression's severity. The standard cut-offs are as follows: 0-9: indicates minimal depression, 10-18: indicates mild depression, 19-29: indicates moderate depression, 30-63: indicates severe depression. Higher total scores indicate more severe depressive symptoms.

Beck anxiety inventory (BAI)

The Beck Anxiety Inventory (BAI) is a 21-question multiple-choice self-report inventory that is used for measuring the severity of an individual's anxiety. The BAI consists of twenty-one questions about how the subject has been feeling in the last month, expressed as common symptoms of anxiety (such as numbness and tingling, sweating not due to heat, and fear of the worst happening). It is designed for an age range of 17-80 years old. Each question has the same set of four possible answer choices, which are arranged in columns and are answered by marking the appropriate one with a cross. These are: NOT AT ALL (0 points), MILDLY: It did not bother me much, (1 point),
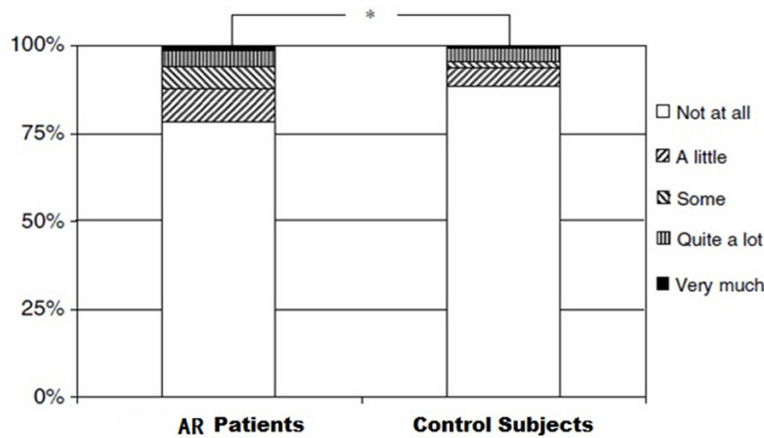
Figure 2. The impact of pain on daily life. More cancer patients than the control subjects reported that pain interfered with daily life 'really much' (1.4 vs. 0.8%), 'quite a lot' (4.6 vs. 4.1%), 'some' (6.3 vs. 1.6%), 'a little bit' (9.3 vs. 5.1%). The distribution of answers in the strata differed between the 2 groups (z = 3.43, P = 0.0003).

MODERATELY: It was very unpleasant, but I could stand it, (2 points), SEVERELY: I could barely stand it, (3 points). The BAI has a maximum score of 63.0-7: minimal level of anxiety, 8-15: mild anxiety, 16-25: moderate anxiety, 26-63: severe anxiety.

Athens insomnia scale (AIS)

AIS is a self-administered inventory consisting of eight items; the first five items assess difficulty with sleep induction, awakenings during the night, early morning awakening, total sleep time and overall quality of sleep, while the last three items pertain to the next-day consequences of insomnia (problems with sense of well-being, overall functioning and sleepiness during the day). Each item of the AIS can be rated 0-3, (with 0 corresponding to *no problem at all* and 3 to *very serious problem*); thus, the total score ranges from 0 (*absence of any sleep-related problem*) to 24 (*the most severe degree of insomnia*). The responders are requested to rate each item positive (i.e. to choose among rating options 1, 2 and 3) only if they had experienced their sleep difficulty at least three times a week during the last month, i.e. a frequency which is consistent with the ICD-10 criteria.

Statistical analysis

Student's t test, analysis of variance, Pearson correlation analysis, multiple linear stepwise regression analysis and path analysis were used in the data analysis.

Results

Comparison of scores for depression, anxiety and insomnia between group of cancer patients and normal control group

The state of depression, anxiety and insomnia in group of AR patients and normal controls were investigated in the study, according to the BDI classification standards, patient with total score ≥14 points was classified as depression, therefore, compared with the control group, the patients group was more likely to be in depression [65 (63.7%) versus 13 (10.7%), respectively, X^2 = -37.341, P<0.001]. BDI total score was higher in the patients group than in the control group (t = -7.672, P<0.001); Compared to the control group, the patients group was more likely to be anxiety [27 (26.5%) versus 7 (5.7%), respectively, X^2 = -5.213, P<0.001]. BAI total score was higher in the patients group than that in the control group (t = -8.626, P<0.001). (5) Compared to the control group, the patients group was more likely to be insomnia [87 (85.3%) versus 29 (23.8%), respectively, X^2 = -9.712, P<0.05]. AIS total score was higher in the patients group than that in the control group t = -14.724, P<0.001). The results were as shown in **Figure 1A**.

Comparison of the SF-12 results between group of AR patients and normal control group

Comparing SF-12 scores in group of AR patients with those in the normal control group, using t test, it was indicated by the results: the total score of SF-12, scores of two scales (physiological health, mental health) and 8 dimensions (physiological function, physiological role, somatic pain, overall health, vitality, social function, emotional role and mental health) in group of chronic pain were all significantly lower than those in normal control group (P<0.001), as shown in **Figure 1B**.

Table 1. Correlation analysis between SF-12 and characteristics of pain, depression, anxiety, and insomnia for AR patients

	Score of pain	Sense of pain	Emotion-al pain	VAS	Severity of pain	Number of painful body parts	Fre-quency of pain	Dura-tion of pain	Scores of de-pression	Scores of anxi-ety	Scores of in-somnia
Total SF-12 score	-0.372**	-0.316**	-0.427**	-0.301**	-0.277**	-0.632**	-0.043	-0.114	-0.646**	-0.527**	-0.509**
Physiological function	-0.236**	-0.218**	-0.258**	-0.329**	-0.226**	-0.527**	-0.009	-0.049	-0.301**	-0.238**	-0.178*
Physiological role	-0.157	-0.131	-0.189*	-0.115	-0.177*	-0.449**	0.059	-0.051	-0.356**	-0.245**	-0.298**
Somatic pain	-0.346**	-0.276**	-0.412**	-0.201*	-0.236**	-0.581**	-0.125	-0.051	-0.472**	-0.362**	-0.423**
Overall health	-0.289**	0.256**	-0.278**	-0.157*	-0.241**	-0.556**	-0.087	-0.034	-0.421**	-0.397**	-0.378**
Vitality	-0.245**	-0.178*	-0.325**	-0.238**	-0.156	-0.452**	-0.056	-0.102	-0.456**	-0.458**	-0.428**
Social function	-0.312**	-0.298**	-0.308**	-0.167	-0.278**	-0.356**	-0.023	-0.094	-0.514**	-0.296**	-0.391**
Emotional role	-0.291**	-0.248**	-0.287**	-0.134	-0.119	-0.459**	0.034	-0.148	-0.328**	-0.378**	-0.267**
Psychological health	-0.132	-0.057	-0.252**	-0.245**	-0.089	-0.426**	-0.054	-0.078	-0.435**	-0.499**	-0.337**

*$P<0.05$, ** $P<0.05$.

Table 2. The definition of variable value

Name of variable	Index	Assignment
X_1	Age	Measured value (continuous variable)
X_2	Sex	Male = 1 Female = 2
X_3	Urban and rural	Urban = 1 Rural = 2
X_4	Marriage	Married = 1, Single = 2, Others = 3
X_5	Education level	Primary school = 1 Secondary school = 2 High school or Secondary Vocational School = 3 University or three -year college = 4 Postgraduate and above = 5
X_6	Monthly income (Yuan)	Monthly income <1000 = 1 1000≤ Monthly income <2000 = 2 2000≤ Monthly income <3000 = 3 3000≤ Monthly income <4000 = 4 Monthly income ≥5000 = 5
X_7	Number of painful body parts	None = 0, 1 part = 2, 2 parts = 3, 3 parts = 4, 4 parts = 5, 5 and more than 5 parts = 6
X_8	Frequency of pain	1 time/week = 1 2 time/week = 2 3 time/week = 3 4 time/week = 4 5 time/week = 5 6 time/week = 6 7 time/week = 7
X_9	Severity of pain	Minor pain = 1 Pain and discomfort = 2 Suffering (need to be treated) = 3 Terribly painful = 4 Extremely painful = 5
X_{10}	Sense of pain	Measured value (continuous variable)
X_{11}	Emotional pain	Measured value (continuous variable)
X_{12}	VAS	Measured value (continuous variable)
X_{13}	Depression	Measured value (continuous variable)
X_{14}	Anxiety	Measured value (continuous variable)
X_{15}	Insomnia	Measured value (continuous variable)

The impact of pain on daily life

More AR patients than the control subjects reported that pain interfered with daily life 'really much' (1.4 vs. 0.8%), 'quite a lot' (4.6 vs. 4.1%), 'some' (6.3 vs. 1.6%), 'a little bit' (9.3 vs. 5.1%). The distribution of answers in the strata differed between the 2 groups (z = 3.43, P = 0.0003), as shown in **Figure 2**.

Correlation analysis between SF-12 total score, scores of individual dimensions and characteristics of pain, depression, anxiety, insomnia in the group of AR patients

Pearson correlation analysis was conducted between life quality and characteristics of pain (sense of pain, emotional pain, VAS, severity of pain, number of painful body parts, frequency

Table 3. Multiple linear stepwise regression analysis on factors affecting life quality of patient with AR

	R	R²	F	P	B	Beta	t	P
Constant	0.812	0.633	31.239	0.000	50.271		41.297	0.000
Depression					-0.278	-0.425	-5.482	0.000
Insomnia					-0.213	-0.226	-3.457	0.000
VAS					-0.028	-0.128	-2.261	0.021
Number of painful body parts					-0.489	-0.137	-2.117	0.018

Table 4. Multiple linear stepwise regression analysis on factors affecting life quality of patient with AR

	R	R²	F	P	B	Beta	t	P
Constant	0.873	0.681	162.382	0.000	54.215		119.238	0.000
Depression					-0.168	-0.377	-7.589	0.000
Insomnia					-0.246	-0.324	-6.126	0.000
VAS					-0.052	-0.179	-6.012	0.000

Table 5. Multiple linear stepwise regression analysis on factors affecting depression of patient with AR

	R	R²	F	P	B	Beta	t	P
Constant	0.643	0.436	79.231	0.000	3.274		3.248	0.000
Insomnia					0.682	0.402	7.891	0.000
VAS					0.087	0.201	3.147	0.001

Table 6. Multiple linear stepwise regression analysis on factors affecting insomnia of patient with AR

	R	R²	F	P	B	Beta	t	P
Constant	0.462	0.321	121.462	0.000	4.125		7.824	0.000
VAS					0.132	0.582	10.237	0.000

total score of pain, sense of pain, emotional pain, severity of pain, number of painful body parts, depression, anxiety, insomnia (r = -0.278~-0.514); The dimension of emotional role was significantly negatively correlated with total score of pain, sense of pain, emotional pain, number of painful body parts, depression, anxiety, insomnia (r = -0.248~-0.459); The dimension of mental health was significantly negatively correlated with emotional pain, VAS, number of painful body parts, depression, anxiety, insomnia (r = -0.245~-0.499), as shown in **Table 1**.

of pain, duration of pain), depression, anxiety and insomnia. The results showed that: SF-12 total score of life quality as well as dimensions of physiological function, somatic pain, overall health for AR patients were all significantly negatively correlated with total score of pain, sense of pain, emotional pain, VAS, severity of pain, number of painful body parts, depression, anxiety, insomnia (r = -0.157~-0.646); The dimension of physiological role was significantly negatively correlated with emotional pain, severity of pain, number of painful body parts, depression, anxiety, insomnia (r = -0.178~-0.527); The dimension of vitality was significantly negatively correlated with total score of pain, sense of pain, emotional pain, VAS, number of painful body parts, depression, anxiety, insomnia (r = -0.178~-0.458); The dimension of social function was significantly negatively correlated with

Factors affecting life quality of patient with AR

Indexing of affecting factors: The results of correlation analysis indicated that, life quality was significantly correlated with characteristics of pain, depression, anxiety, insomnia, therefore, in order to further investigate the impacts of pain, depression, anxiety, insomnia on life quality of patient with chronic pain, assign values to them separately to perform multiple linear stepwise regression analysis and path analysis, as shown in **Table 2**.

Multiple linear stepwise regression analysis on factors affecting life quality of patient with AR

Take factors of age, gender, urban and rural area, marriage, education, monthly income, number of painful body parts, frequency of

pain, severity of pain, sense of pain, emotional pain, VAS, depression, anxiety, insomnia as independent variable, life quality as dependent variable. Use stepwise introduction method to perform multiple linear stepwise regression analysis, based on the standards of a_{in} = 0.10, a_{out} = 0.15. The results showed that, factors of depression, insomnia, VAS, number of painful body parts entered into the regression equation. F = 31.239, P = 0.000, therefore, the multiple linear regression analysis was statistically significant. The multiple correlation coefficient for the regression equation R = 0.812, and coefficient of determination R^2 = 0.633, indicating that 63.3% of changes of dependent variable (life quality of patient with chronic pain) could be explained by independent variable of stepwise fitting multiple linear regression equation (depression, insomnia, VAS, number of painful body parts). From the standardized regression coefficient, we learnt that the maximum impact on life quality of patient with chronic pain was caused by depression (Beta = -0.425), while the second was insomnia (Beta = -0.226), as shown in **Table 3**.

Path analysis on factors affecting life quality of patient with AR

Perform path analysis on factors affecting life quality of patient with AR, based on the results of multiple linear stepwise regression analysis. Path analysis can only test dominance variance with continuous changes, therefore, "number of painful body parts" was not included into path analysis. Successively define the variable with maximum impact as dependent variable, and the rest variables as independent ones. Conduct multiple linear regression analysis, the results were shown in **Tables 4**-**6** respectively. It could be seen from the standardized regression coefficient that, the more severe the depression (Beta = -0.377**) and insomnia (Beta = -0.324**) was, the more intensive the pain (Beta = -0.179**) was, the worse the life quality of patient with AR.

Discussion

Allergic rhinitis is not only limited to the physical symptoms of the nose and eyes but also provokes disturbances in the general well-being of the affected subjects. Recent evidence suggests that AR patients have a reduced health-related QOL as a result of physical impairments

as well as psychological ones [18]. Researches have also demonstrated that the majority of AR patients will have impairments and that these often go undetected and/or untreated, and consequently may result in mental distress [11-15, 19].

From the results in the study, the correlation coefficient between emotional pain and life quality (r = -0.434) was higher than that between sense of pain and life quality (r = -0.315), indicating possible greater impact of emotional pain on life quality of the patients. In addition, the correlation coefficient between total score of pain and depression (r = 0.416), anxiety (r = 0.425) was higher than that between total score of pain and SF-12 total score (r = -0.383), therefore, it could be inferred that, pain might further affect life quality of the patients by making patients produce adverse emotional experience.

The results in this study are indicative of the complex variability in the temporal character of pain experienced by people living with AR. The life quality for AR patients with depression and anxiety was significantly lower than that of patients without depression and anxiety, of which, the life quality of the patients with severe depression was significantly lower than that of the patients with mild depression. Thus, it was indicated that, depression and anxiety might affect life quality of the patients, and severe depression produced greater impact on life quality. It was suggested that, depression might significantly damage life quality of patients with chronic pain, physical malaise and adverse emotional experience for patients with depression significantly exceeded to that for patients without depression, as for state of function, patients with depression was significantly worse than that of patients without depression. The results of investigation on 2650 patients with chronic pain showed that, the dimensions of somatic health and mental health in SF-12 for patients with anxiety were all significantly lower than those for patients without anxiety.

It was demonstrated in the study that, total score of life quality and score of the 8 dimensions for AR patients was significantly negatively correlated with depression and anxiety, suggesting the more severe the emotion of depression and anxiety for the patients was, the worse the life quality was, and all correlation coeffi-

cients between depression, anxiety and 8 dimensions of SF-12 were relatively large, the maximum one was 0.640. Thus, it was indicated that, depression, anxiety played an important role in decline of life quality for patients with chronic pain, which was consistent with the study result achieved by Bottomley [32]. It was also suggested in the study performed by Velikova [33] that, depression might cause the decrease of social function for patient with chronic pain. In addition, similar result was also achieved in relevant domestic studies on depression, anxiety and life quality, for example, it was shown in the study conducted by Ko [34] in patients with functional dyspepsia that, the score of Self-Rating Depression Scale (SDS) and Self-Rating Anxiety Scale (SAS) was all significantly negatively correlated with the scores of 8 dimensions in SF-36. Depression and anxiety produced extensive negative impact on life quality of patients with chronic pain, and many aspects of life quality were involved, especially causing maximum impact on mental health and vitality of patients with chronic pain [31]. The possible mechanism was that, negative emotions as depression, anxiety resulted in decline of mental function for patients, consequently affecting life quality. On the contrary, decline of life quality also would increase the adverse emotion of the patients, consequently forming a vicious cycle of which spiritual psychology and life quality affected each other, and interacted as both cause and effect.

Meanwhile, it was demonstrated in the study that, the life quality of patients with insomnia was significantly worse than that of patients without insomnia, this might because the sleep habits for patients with AR generally changed, being hard to fall asleep and maintain sleep state, and causing exhausted and weary at daytime, consequently decreasing life quality, which was consistent with the study result achieved by Fleisher [35]. From the results in the study, the total score of life quality for AR patients and the scores of 8 dimensions were significantly negatively correlated with insomnia, namely, the severity of insomnia was positively correlated with level of impairment of life quality for patients with chronic pain, along with the aggravation of insomnia, level of impairment of life quality was increased. The direct consequence caused by insomnia itself was the primary factor affecting life quality of

patients with chronic pain. It was reported that the negative impact of insomnia on daytime function of patients with chronic pain was also the primary factor causing decline of their life quality. For example, the patients with insomnia were sensitive to environment, irritable, their attention and memories were impaired, consequently affecting their daytime function directly. Moreover, since the patients relied on sedative hypnotics due to long-term insomnia, producing heavy mental burden, they are prone to believe that it was hard to be cured for themselves, and necessary to take hypnotics for a long time, worrying about drug dependence, this made a part of patients produce emotions of depression and anxiety, consequently affecting life quality of the patients. The results of multiple linear stepwise regression analysis demonstrated that, depression, insomnia, VAS, number of painful body parts entered into the regression equation, depression, insomnia and pain produced impact on life quality of AR patients, the 3 factors of pain, depression and anxiety could be used to interpret 50.2% of life quality changes for patients with chronic pain, of which, the impact of depression emotion was especially obvious.

The result of path analysis demonstrated the impacts of pain, depression, insomnia on life quality and the correlation among the three variables. Depression directly affect the life quality of AR patients, and the more severe the depression was, the worse the life quality was (Beta = -0.385). On one hand, insomnia could directly affect the life quality of AR patients, and the more severe the insomnia was, the worse the life quality was (Beta = -0.337), on the other hand, insomnia could affect the life quality of AR patients via depression. There were also two forms for pain to affect life quality: one is to directly affect the life quality significantly, another is to indirectly affect the life quality via variables of depression and insomnia, and the more severe the pain was, the worse the life quality of patients with chronic pain was (Beta = -0.265). Therefore, depression, insomnia, pain could all affect the life quality of AR patients significantly, especially depression produced the most direct impact on life quality.

The summary of above results showed that, changes of life quality for AR patients were

closely related to severity of pain, level of depression, level of anxiety and insomnia, suggesting that, to perform well targeted mental and biological intervention aiming at chronic pain, negative emotions and insomnia of AR patients might improve the level of life quality for them significantly.

Disclosure of conflict of interest

None.

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