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Original Article

Comprehensive psychological intervention in bronchial asthma

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Abstract: Objective: To investigate the effect of comprehensive psychological interventions on asthma-specific anxiety, depression, pulmonary function, quality of life (QOF) and asthma control level in patients with asthma. Methods: A total of 156 patients with bronchial asthma were admitted to our hospital from February 2014 through November 2015. They were randomly assigned to the control group and the comprehensive psychological intervention group (the CPI group) in terms of the received care programs. The CPI group received comprehensive psychological interventions covering health education and cognitive behavioral therapy after routine clinical care, whereas the control group received routine clinical care alone. The differences in the Zung Self-Rating Anxiety Scale (SAS) score, the Zung Self-Rating Depression Scale (SDS) score, pulmonary function, changes in asthma quality of life questionnaire (AQLQ) and post-intervention/care asthma control level before admission and at one month after discharge were recorded and compared between the two groups. Results: The SAS score, the SDS score, pulmonary function and the difference in AQLQ in the CPI group were significantly higher than those in the control group (all $P<0.05$). At 1 month after discharge, the rates of uncontrolled asthma were 5.1% in the CPI group and 19.1% in the control group; the rates of complete control were 50.0% and 39.7%, respectively. The asthma control level was better in the CPI group than in the control group ($P=0.029$). Conclusion: Comprehensive psychological interventions can effectively relieve the symptoms of anxiety and depression, and improve the pulmonary function, the quality of life of patients and the clinical efficacy.

Keywords: Bronchial asthma, psychological intervention, anxiety, depression, pulmonary function, quality of life

Introduction

Asthma is one of the common chronic disorders associated with the respiratory tract. With deteriorating environmental pollution, changes in climate and people's lifestyle, the prevalence of adult asthma is increasing in recent years in China. According to the 2002-2003 statistical data from the World Health Organization, the rate of adult asthma was 0.2% in China. A recent study revealed, however, that the rate of adult asthma was high up to 0.38% in China [1, 2]. Asthma is characterized by airway inflammation, airway hyper-responsiveness and reversible ventilatory dysfunction, and recurrent attacks, which not only has a detrimental impact on the patient's physical and mental health, but also brings about a huge social and economic burden [3].

It is generally believed that asthma is a multifactor psychosomatic disease. The development of asthma is strikingly correlated with the patient's psychological factors and individual characteristics, and a variety of psychological diseases may be associated with the development of asthma in adults [4, 5]. Asthma, in turn, may also give rise to the patient's psychological and emotional problems, leading to aggravated conditions [6, 7]. The target of asthma treatment is to make asthma under control by means of standard treatment and management. Multiple studies, however, have demonstrated that most asthma patients fail to meet the requirements for prevention and control of asthma in The Global Initiative for Asthma (GINA) [8, 9]. A major cause for poor asthma control was shown to be ignorance of the patient's mental and psychological factors. Combining psychological interventions, including health education and cognitive therapy with the existing clinical care programs, was effective in improving the asthma patient's adherence to the treatment, and reducing the risks for asthma attacks [10, 11].

However, the psychological intervention programs and results in the current studies are not completely consistent, and there are no recommendations for specific psychological interventions in clinical practice [12, 13]. Our study was to evaluate the effect of comprehensive psychological interventions on health care of the patients with bronchial asthma, to get a good understanding of the clinical efficacy of comprehensive psychological interventions on anxiety, depression and quality of life in patients, so as to lay a scientific foundation for how to improve the effectiveness of health care regimens for bronchial asthma.

Materials and methods

Study subjects

The eligible subjects were 156 adult patients with bronchial asthma who were admitted to the Pneumology Department of our hospital between February 2014 and November 2015. The eligibility criteria for the patients were an age of over 18 years; meeting the diagnostic criteria in line with the Chinese Asthma Guidelines developed by the Asthma Group from Respiratory Medicine Branch of the Chinese Medical Association. Any patient was excluded if they were companied by severe basic diseases including cardiovascular, hepatic, renal and neural disorders; they had occupational asthma or they were unable to receive psychological intervention due to language barriers or other reasons. Each participant provided written informed consent, and the Hospital Ethics Committee approved the study.

Group assignment and interventions

The patients were randomly assigned to the control group (n=78) and the comprehensive psychological intervention group (the CPI group, n=78) in terms of the random digits table. All the patients in the control group were given routine care programs of respiratory medicine. The specific measures included close examinations of vital signs, precursory symptoms of asthma attacks, early corresponding measures as well as symptomatic care. In addition to routine care programs, the CPI group also received psychological interventions conducted by the caregivers who had received the relevant professional psychological intervention trainings. After the patients were admitted to our hospital, the caregivers talked with them to know their major problems, and then carried out comprehensive psychological interventions which comprised health education: regular lectures on asthma-related health education once or twice weekly, with the specific education covering knowledge regarding asthma disease and techniques of psychological adjustment; cognitive behavior interventions: the caregivers helped the patients to identify, and correct their wrong recognitions through one-to-one communication, enabling the patients to rebuild their cognitive structure. They also instructed the patients to take part in progressive relaxation trainings [14]. Placed in a supine position, the patients closed their both eyes while gradually relaxing the muscles from the head to the feet under the voice guidance. In this manner, the patients were involved in active self-relaxation, promoting their emotional stability. Moreover, the caregivers carefully listened to the patients' talking about their anxiety, fear and other emotional problems, induced them to speak out their inner thoughts and encouraged them to establish confidence in the fights against the disease, helped them to get deep self-concepts and be aware of their self-values and self-demands; encouraged them to realize their own ideals. During the entire period of hospitalization, all the patients were given comprehensive psychological interventions.

Outcome measures

(1) Psychological outcomes: The patients' depression and anxiety symptoms at admission and at 1-month follow up after discharge were assessed using the Zung Self-Rating Anxiety Scale (SAS) and the Zung Self-Rating Depression Scale (SDS), respectively [15, 16]. The SDS score <50 points was specified as no depression, 50-69 points as mild depression, 60-69 points as moderate depression, and >70 points as severe depression. On the other hand, the SAS scores less than 50 points were defined as normal anxiety, 50-59 as mild anxiety, 60-69 as moderate anxiety, and 70 or higher as severe anxiety.

(2) Pulmonary function outcome: the outcomes of pulmonary functions included the peak expiratory flow (PEF), the forced expiratory volume in one second (FEV_1), and the ratio of the forced expiratory volume (FEV) to forced vital capacity (FVC). At admission and at 1-month follow up after discharge, all the patients in the two groups received pulmonary function tests three

Table 1. Basic data of the patients in the two groups

Variable	CPI (n=78)	Control (n=78)	x^2/t	P
Age	56.7±7.1	57.8±6.9	0.981	0.328
Gender				
Male	40 (51.3)	34 (43.6)	0.926	0.336
Female	38 (48.7)	44 (56.4)		
Smoking				
No	53 (75.6)	59 (67.9)	1.140	0.286
Yes	25 (24.4)	19 (32.1)		
Marital status				
Single	2 (2.6)	3 (3.8)		0.861*
Married	70 (89.7)	68 (87.2)		
Divorce/Widow	6 (7.7)	7 (9.0)		
Education completed				
Junior middle school or below	12 (15.4)	15 (19.2)	0.550	0.760
High school	43 (55.1)	39 (50.0)		
University or higher	23 (29.5)	24 (30.8)		
Asthma course (year)				
<5	12 (15.4)	16 (20.5)	2.608	0.271
5-10	17 (21.8)	23 (29.5)		
>10	49 (62.8)	39 (50.0)		

Note: *The Fisher's exact test.

times for each test, each having at least a 5-minute interval. The best value for each test was taken as the data for the session.

(3) Quality of life outcomes: The asthma quality of life questionnaires (AQLQ) for adults were employed to measure the quality of life in adult with asthma using five items of activity limitation, asthma symptoms, physiological condition, response to stimulus sources and self-reported health concerns. Higher scores indicate better quality of life in patients with asthma [17].

(4) Asthma control level: An asthma control test (ACT) was used to assess asthma control levels of the patients in the past four weeks. The test consists of a scale of 25 points where 25 indicates complete asthma control, 20-24 good asthma control, and less than 20 points uncontrolled asthma. Higher score represents better asthma control [18].

The questionnaires described in (1) (3) and (4) were distributed to the patients by the specially-trained nurses on the spot of survey. The nurses specified the contents and requirements of the questionnaires to the patients in details when the patients filled in the questionnaires. They also checked the filled questionnaires one by one to ensure that the data were reliable and real.

Statistical analysis

The scale scores were expressed as mean ± standard deviation, a two-sample independent t-test was utilized to compare the differences at baseline and the differences before and after treatment between the groups, respectively. A paired t-test was applied to compare the differences before and after treatment within the same group. The differences among categorical variables were examined using the two-sided x^2 test or the Fisher's exact test. The statistical significance level of the difference was specified as the two-sided α=0.05.

Results

Basic data of the patients in the two groups

Table 1 shows the baseline and clinical characteristics of the patients in the two groups. There were no significant differences between the two groups in age, gender distribution, smoking, marriage, education backgrounds and the courses of asthma. Moreover, the baseline data of the patient were similar between the two groups.

Psychological and emotional status before and after interventions/care of the two groups

The SAS scores of the CPI group and the control group were 47.5±7.9 and 46.2±6.9, respectively while the SDS scores were 43.6±6.3 and 42.1±5.7, respectively. The above mentioned scores did not show significant differences between the two groups (all P>0.05). At one month after discharge, the SAS scores and the SDS scores decreased in the CPI group and in the control group (the paired t-test before and after treatment, all P<0.001). The differences in the SAS scores between before and after intervention/care were significantly greater in the CPI group than in the control group, so were

Table 2. Psychological and emotional status before and after psychological interventions/care of the two groups

Group	SAS score			SDS score		
	Pre-I/C	Post-I/C	Difference	Pre-I/C	Post-I/C	Difference
CPI	47.5±7.9	33.0±5.6	13.5±3.1	43.6±6.3	31.5±4.9	12.1±3.3
Control	46.2±6.9	34.5±4.1	11.7±2.6	42.1±5.7	31.9±4.6	10.2±2.3
t	1.352		3.929	1.560		4.172
p	0.178		<0.001	0.121		<0.001

Note: Pre-I/C denotes pre-intervention/care; Post-I denotes post- intervention/care.

the difference in the SDS scores (all P<0.001, **Table 2**).

Comparison of pulmonary functions before and after intervention/care between the two groups

Table 3 shows the comparison of the results of pulmonary function tests between the two groups at admission and at 1 month after discharge. The levels of PEF, FEV_1/FVC and FEV_1 at admission were 58.37±5.89, 54.82±4.63 and 50.38±4.89, respectively in the CPI group while in the control group they were 57.61±6.89, 55.29±5.02 and 51.71±5.89, respectively. And the difference was not statistically significant (all P>0.05). At 1 month after discharge, the levels of PEF, FEV_1/FVC and FEV_1 elevated in both groups (the paired t-test before and after treatment, all P<0.001). The difference in the PEF levels before and after intervention/care in the CPI group were significantly higher than those in the control group, so were the differences in the FEV_1/FVC and FEV_1 levels (all P<0.05).

Comparison of the AQLQ scores before and after intervention/care between the two groups

In **Table 4**, there was no difference in AQLQ scores between the CPI group and the control group (all P>0.05), but the scores were improved at 1 month after discharge in both groups (Paired t-test before and after treatment, all P<0.001). The comparison of the AQLQ scores before and after care/intervention between the two groups showed that greater improvements in the categories including activity limitation, asthma symptoms, physiological condition, response to stimulus sources and self-reported health concerns in the CPI group (all P<0.05).

Comparison of asthma control levels before and after intervention/care between the two groups

Table 5 shows asthma control level of the two groups at 1-month follow-up after discharge. The rates of uncontrolled asthma observed in the CPI group and the control group were 5.1% and 19.1, respectively whereas the rates of complete control were 50.0% and 39.7%, respectively. Asthma control in the CPI group at one month after discharge was better than that in the control group (P=0.029).

Discussion

Asthma is one of the typical psychosomatic diseases involved in the respiratory system. The prevalence of asthma is impacted by the interaction of biological, psychological and social factors [19]. Currently, asthma, mental and psychological factors are deemed to be mutually affected. Psychiatric and psychological disorders may induce the development and onset of asthma, leading to aggravated asthma. On the contrary, the development of asthma may in turn cause psychological and emotional disorders in patients, resulting in a vicious circle [20, 21]. Poor asthma control has beem showed to be closely correlated with anxiety and depression, and that the patients with anxiety and depression symptoms are more likely to consume more medical resources [22]. Consequently, in addition to the standard medication, the psychological interventions used in the management of asthma control have also attracted growing attention.

The major goal of psychological intervention is to relieve the patient's anxiety, depression and other mental and psychological disorders, steering to healthier psychological status. A wide range of psychological interventions techniques have been applied in asthma control, such as behavior, psychological education, cogni-tion, relaxation, biofeedback etc. [12, 23]. The findings of a systematic review included nine randomized controlled trials revealed that cognitive behavioral therapy significantly improved anxiety, quality of life, and asthma control levels in adults with asthma as compared

Table 3. Comparison of pulmonary functions before and after intervention/care between the two groups

Pulmonary function	Group	Pre-I/C	Post-I/C	Difference	t	P
PEF	CPI	58.37±5.89	72.38±4.81	14.01±2.58	2.990	0.003
	Control	57.61±6.89	70.42±4.65	12.81±2.43		
FEV_1/FVC	CPI	54.82±4.63	67.21±4.07	12.39±2.27	4.82	<0.001
	Control	55.29±5.02	65.59±5.22	10.30±2.12		
FEV_1	CPI	50.38±4.89	61.42±4.81	11.04±2.49	2.250	0.03
	Control	51.71±5.89	61.92±4.65	10.21±2.10		

Table 4. Comparison of the AQLQ scores before and after intervention/care between the two groups

AQLQ	Group	Pre-I/C	Post-I/C	Difference	t	P
AL	CPI	3.76±0.54	5.19±0.67	1.43±0.31	3.154	0.002
	Control	3.82±0.61	5.29±0.48	1.29±0.24		
AS	CPI	3.81±0.49	6.01±0.56	2.19±0.35	2.457	0.015
	Control	3.89±0.53	5.93±0.61	2.04±0.41		
PC	CPI	4.07±0.52	6.18±0.59	2.11±0.30	2.583	0.011
	Control	3.98±0.43	5.97±0.51	1.99±0.28		
RSS	CPI	3.76±0.41	4.78±0.36	1.02±0.21	3.119	0.002
	Control	3.65±0.41	4.57±0.41	0.92±0.19		
SRHC	CPI	3.54±0.39	4.67±0.42	1.13±0.22	2.497	0.014
	Control	3.44±0.43	4.48±0.33	1.04±0.23		

Note: AL denotes activity limitation; AS denotes asthma symptoms; PC denotes physiological condition; RSS denotes response to stimulus sources; SRHC denotes self-reported health concerns.

Table 5. Comparison of asthma control levels before and after intervention/care between the two groups

Group	Case	Asthma control level			x^2	P
		Complete control (%)	Partial control (%)	Uncontrolled (%)		
CPI	78	39 (50.0%)	35 (44.9%)	4 (5.1%)	7.073	0.029
Control	78	27 (39.7%)	38 (41.2%)	13 (19.1%)		

with the conventional intervention groups [14]. In the present study, when compared with those at admission, anxiety and depression symptoms respectively at 1 month after discharge were considerably relieved in the CPI group and the control group. Additionally, the improvement in the CPI group was significantly higher than that in the control group. Our findings were similar to those of other studies [24]. In addition to improvements in the psychological status, we also observed that the levels of PEF, FEV_1 and FEV_1/FVC and other pulmonary function indexes and asthma control levels in the CPI group were significantly better than those of the control group. Multiple studies have confirmed that pulmonary function examinations have a beneficial adjunctive effect on the diagnosis and assessment of asthma control. However, the current findings with regard to the association of adverse emotion symptoms including anxiety with pulmonary function in asthma patients are not consistent. One study revealed that adverse emotions triggered by daily events, depression in particular, reduced pulmonary function in patients with asthma, but other studies suggested that it was not associated with impaired pulmonary functions [25, 26]. In several studies, pulmonary functions were taken as the variables assessing the effects of psychological interventions on asthma control levels. On a meta-analysis, relaxation therapy had no significant effect on FEV_1 improvement, but the biofeedback therapy was proved to improve pulmonary function when the maximum expiratory volume was taken as an outcome index in case of varied total lung capacity between groups [27]. In the present study, comprehensive psychological interventions contributed to a greater improvement in pulmonary function than routine care programs, and the results were similar to those of Lehrer PM and of other studies in China [27, 28]. However, given the indexes applied in the intervention techniques and the pulmonary function tests in the above studies are not exactly the same, so further studies are still needed to explore whether psychological interventions can improve the pulmonary functions of patients with asthma.

The asthma control level is an underlying factor determining the quality of life in patients with asthma [29]. The AQLQ and ACT scores were

used as the variables assessing quality of life and asthma control level in our study. The magnitude of improvements in individual factors in the AQLQ questionnaires and asthma control levels before and after intervention/care was found to be significantly higher in the CPI group than in the control group. This indicates that the overall quality of life of the patients in the CPI group was substantially improved and asthma was under better control, consistent with the findings of previous literature [14, 28].

In conclusion, conducting comprehensive psychological intervention in the care course of asthma can significantly reduce the severity of depression and anxiety in patients, enhance pulmonary functions, and improve quality of life and asthma control levels in patients. However, some limitations still exist in this study. A randomized sampling was employed, and it was not blind design in nature, which could not avoid the impact of certain bias. Moreover, due to a small sample size, the asthma patients were not analyzed by stratification, we only analyzed the clinical efficacy of psychological interventions in patients during hospital stay. The long-term effect of interventions needs further evaluation. In the future studies, randomized controlled trials with larger samples and clear assessment indexes and outcomes are still required to evaluate the long-term effects of comprehensive psychological intervention on asthma control, providing more powerful evidence supporting psychological intervention in the control and treatment of asthma, and thereby improving the treatment of asthma in patients.

Disclosure of conflict of interest

None.

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