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Role of detailed psychological evaluation and treatment in pulmonary rehabilitation programs for patients with chronic obstructive pulmonary disease

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Abstract

Psychological co-morbidities are common in chronic obstructive pulmonary disease (COPD) but remain overlooked. Psychosocial interventions are deemed to promote mental health and optimize management. This study aimed to determine the role of detailed psychological evaluation and treatment in the comprehensive management of COPD.

COPD patients after screening with the general health questionnaire-12 (GHQ-12) for psychological co-morbidity were divided into three groups (26 patients each): i) group A [GHQ-12 score < 3, received pulmonary rehabilitation (PR) and standard medical management]; ii and iii) group B and C (GHQ-12 score > 3, in addition, received management by a psychiatrist and counseling by a pulmonologist, respectively). At baseline and 8 weeks of follow-up, all participants were evaluated for respiratory [forced expiratory volume in the first second (FEV₁), six-minute walk distance (6-MWD), St. George's respiratory questionnaire (SGRQ), modified medical research council (mMRC) dyspnea scale], and psychological [GHQ-12, patient distress thermometer (PDT), coping strategy checklist (CSCL), World Health Organization-quality of life-brief (WHOQOL-Bref-26), and depression anxiety stress scales (DASS)] parameters.

Psychological distress (GHQ-12 > 3) decreased significantly at follow-up, with 11.5% and 53.8% of patients having psychological distress in groups B and C, respectively, *versus* baseline ($p < 0.001$). mMRC score, SGRQ score, FEV₁ and 6-MWD significantly improved in all three groups. Improvement in mMRC and SGRQ was maximal in group B when compared with the other groups. PDT, CSCL, and WHO-QOL-Bref-26 scores improved significantly at follow-up in all three groups, with maximum improvement in group B, followed by group C, and then group A. The DASS score also improved maximally in group B.

Patients should be screened for psychological co-morbidities using simple screening tools. PR plays an important role in improving the psychology of COPD patients. However, results are better with directed psycho-educative sessions by non-experts and best with definitive treatment by psychiatrists.

Key words: COPD, PR, psychological distress.

Introduction

Chronic obstructive pulmonary disease (COPD) is a disease which not only causes a health burden but also leads to major economic issues worldwide. It is estimated that 3.2 million deaths were caused by COPD globally and it is the 7th leading cause of years of life lost [1]. Increasing evidence indicates that COPD is a complex disease, with multi-system involvement. Systemic inflammation caused by the spill over of inflammatory mediators may initiate or worsen co-morbid diseases such as osteoporosis, anaemia, heart disease, anxiety, depression, and lung cancer [2].

Emotional disturbances particularly depression and anxiety are common in individuals with COPD. They negatively impact the overall quality of life as they affect the emotional, social, and physical functioning [3]. A recent Indian based study has shown a high prevalence of psychiatric co-morbidities in COPD patients [4].

Literature worldwide has shown that pulmonary rehabilitation (PR) improves anxiety and depression, and, conversely these conditions affect rehabilitation completion rates [5]. The American Thoracic Society/European Respiratory Society statement recommends that anxiety and depression should be assessed in participants of PR programs and suitable support should be provided to these individuals [6]. There seems an urgent need for evidence-based psychosocial interventions to promote mental health and optimise effective self-management in COPD patients.

This study aimed to determine the role of psychiatric intervention in the comprehensive management of COPD patients.

Materials and Methods

The study was conducted in the Department of Pulmonary, Critical care and Sleep Medicine, in collaboration with the Department of Psychiatry, Government Medical College and Hospital, Sector-32, Chandigarh, India. This was a longitudinal interventional study.

Adult patients diagnosed with COPD as per Global Initiative for Obstructive lung disease (GOLD) guidelines [7], and managed in the Department of Pulmonary, Critical care and Sleep Medicine, were included in the study.

Exclusion Criteria: Patients were excluded if they were less than 18 years of age, refused consent, were uncooperative, had a lack of competency in completing the questionnaires, had psychiatric illness prior to the diagnosis of COPD and/ or were on treatment for the same, had evident memory deficits on clinical assessment.

The optimum sample size was calculated based on the assumption regarding the anticipated improvement in respiratory and psychological parameters in patients of COPD. Based on clinical experience, it was expected that pulmonary intervention alone will result in about

40% improvement whereas the addition of psychiatric intervention will result in improvement in 75% cases. Taking 80% power of the test and 5% level of significance the optimal sample size came out to be 26. Accordingly, it was planned to recruit 26 patients each in the three groups.

Necessary information was given and informed consent was obtained from each patient. Each participant was subjected at baseline to detailed medical history, general physical and systemic examination and routine investigations. Arterial blood gas analysis, chest radiograph and electrocardiography was also done. Each patient was initially assessed through cardiopulmonary exercise evaluation. The parameters used for pulmonary assessment were Forced Expiratory Volume in first second (FEV₁) measured by spirometry [7], Six-minute walk distance (6-MWD) for exercise capacity [8], St. George's Respiratory Questionnaire (SGRQ) [9], and Modified medical research council (mMRC) scale for dyspnoea [7].

Each patient underwent psychological assessment using General Health Questionnaire-12 (GHQ-12) Hindi version. GHQ-12 is a 12-item screening instrument commonly used for measuring psychological distress and is validated in the Indian population [10-12]. Based on its score, the participants were divided into 3 groups of 26 patients each.

Group A consisted of patients with GHQ-12 score ≤ 3 , i.e. "psychologically healthy COPD patients". They received PR (twice a week session for 8 weeks) and standard medical management of the disease (Figure 1).

Those patients who had GHQ-12 score >3 were counselled regarding detailed assessment by psychiatrist, and were divided into two groups: Group B and C. Group B patients were given PR along with standard medical management, and treatment by the consultant Department of Psychiatry, from the same institution. The treatment provided by the psychiatrist was tailored to the needs of the individual patient. Based on a clinical interview, the psychiatrist chose the treatment amongst the three modalities i.e. medications, supportive psychotherapy or a combination of the two on the basis of severity of the psychological morbidity. The patient was called for follow-up as per need. Every effort was made to match the follow-up day visit with the scheduled PR visit. Those patients who refused assessment and management by the psychiatrist constituted Group C. They, along with their relatives, were explained by the pulmonologist about the cause, course and management of COPD in detail and the need to remain compliant to treatment. The pulmonologist also delivered structured counselling and educative sessions, encompassing the need of PR and medical management, their effectiveness in improving the lung condition as well as possible secondary improvement in the psychological state (Figure 1).

The PR Programme included two components. The first one was education and nutritional advice. Patients were given basic information about COPD and its consequences and were educated about breathing and exercise techniques and their self-administration. Current smokers were encouraged to quit smoking. The other component included exercise prescription which the patients received in the departmental Pulmonary Rehabilitation Centre. It consisted of 2 supervised exercise sessions per week, each of 1-hour duration, for a total period of 8 weeks. Exercise sessions included upper and lower extremity aerobic exercises, resistance exercises, and ventilatory muscle training exercises. All the sessions were conducted under supervision of a respiratory physiotherapist. Patients were also instructed to record their home exercises in a diary, which was reviewed weekly at the Pulmonary Rehabilitation Centre. Patients were considered to be compliant if they completed at least 70% or more of the PR sessions.

Patients who could not complete the PR/ requisite compliance and follow-ups with the psychiatrist were excluded from final evaluation.

Psychiatric health of patients was also assessed using various other parameters like Patient distress thermometer (PDT) [13], Coping strategy checklist (CSCL) [14], WHO-Quality of Life- Brief – Hindi Version (WHOQOL-Bref-26) [15], and Depression Anxiety Stress Scales (DASS) [16]. PDT is a modified visual analogue scale that resembles a thermometer, ranges from 0 to 10, and is used to assess patients for distress. CSCL is a self-administered scale, comprising of 36 coping strategies used to deal with stressful situations and indicates their use in day to day life. WHOQOL-Bref-26 contains a total of 26 questions and is used to assess quality of life. DASS measures the degree of depression, anxiety and stress.

Patients in all the three groups were followed up for a period of 8 weeks. All patients were re-assessed at 8 weeks using the same respiratory and psychological parameters/ scales i.e. FEV₁, 6-MWD, SGRQ, mMRC scale, GHQ-12, PDT, CSCL, WHOQOL-Bref-26 and DASS-21. Drop outs were excluded, and 26 patients in each group who completed the study requirements as per protocol were finally analysed.

The study was approved by the Institute's Research and Ethics Committee vide letter no. GMC/IEC/2018/160.

Statistical Analysis

Data analysis was included frequency tabulation, association of variables based on Chi-square and risk ratio estimates with 95% Confidence Interval. All quantitative variables were estimated using measures of central location (mean and median) and measures of dispersion (standard deviation). In normally distributed data, comparisons were made by t-test and One-way ANOVA. Where data was not normally distributed, variables were compared using

Wilcoxon Signed Ranks Test, Mann-Whitney U test and Kruskal Wallis test followed by LSD or Turkey post hoc test. All statistical tests were two-sided and the level of statistical significance was set at 5% (p value <0.05).

Results

The mean age of the study cohort was 61.78 \pm 9.98 years and all groups were age-matched. Majority were males, smokers, and residing in rural areas. Approximately half of the participants had systemic co-morbidities. All the three groups were matched with respect to the above mentioned demographic variables (Table 1).

At baseline, all the patients in group A had GHQ-12 \leq 3, and hence were not suffering from any psychological distress. All the patients in groups B and C had GHQ-12 >3, and were thus suffering from psychological distress (Figure 1). Both B and C groups improved significantly at follow-up, with only 3 (11.5%) and 14 (53.8%) patients having psychological distress in each group (p<0.001). More number of Group B patients showed improvement in psychological distress (measured by GHQ-12 being \leq 3), when compared with patients in group C (p<0.001) (Table 2).

After 8 weeks of intervention as per plan (Figure 1), respiratory symptom perception measured in terms of mMRC dyspnea scale, quality of life (QOL) measured by SGRQ, lung function measured by FEV₁ and exercise capacity measured by 6-MWD distance showed improvement in all the three groups. Improvement in mMRC dyspnea scale and SGRQ score was maximum in Group B, when compared amongst the groups. However, no significant additional improvement in Group B in terms of FEV₁ and 6-MWD were seen (Table 3 and 4). The psychiatric scales used in the assessment (viz PDT, CSCL, WHO-QOL-Bref-26 and DASS) showed a similar trend as GHQ-12. PDT score, CSCL score and WHO-QOL-Bref-26 score improved significantly at follow-up in all the three groups with maximum improvement in group B followed by group C and then group A. DASS-21 score also improved maximally in group B (Tables 4 and 5).

Discussion

Psychological co-morbidities are commonly seen in patients of COPD because of the chronicity and nature of the disease, resulting debility and multi-system involvement [7]. However, despite the GOLD guidelines, and various other statutory bodies repeatedly signifying the importance of their identification and management, [4,17-19] they have usually remained under-diagnosed and undertreated. Henceforth, because of paucity of literature, various agencies from time to time have recommended the need for undertaking research studies to identify psychological co-morbidities in COPD and examine the role of

specific psychological intervention in such patients [20,21]. No data from the Indian sub-continent could be traced. The present study which aimed to evaluate the additional role of psychological intervention in the comprehensive management of the patients of COPD was hence planned in accordance with such recommendations.

The three groups in our study were matched with respect to age, gender, rural/urban background, smoking habits and co-morbidities, eliminating any bias in our groups at baseline, or any effect on the results at follow-up because of these socio-demographic factors.

In the present study, GHQ-12 was used as a psychiatric tool to screen COPD patients for psychological co-morbidity and decide further course of action. It served as an acceptable scoring system in our patients as it is simple, valid and was easily administered by even a pulmonologist in shortest time frames in our busy out-patient setups. In both Groups B and C, significantly lesser numbers of patients were found to be suffering from psychological distress (GHQ>3) at follow-up (11.5% and 53.8% respectively), than at baseline. The mean GHQ-12 score in group B and C at baseline was 6.35 ± 2.06 and 5.08 ± 1.50 respectively. At follow-up, it improved to 1.73 ± 1.08 and 3.73 ± 1.28 respectively. Both these results showed that extent of improvement in psychological distress was maximal in group B, where the management was done by the psychiatrist. The counselling by the pulmonologist in Group C also yielded encouraging results as lesser number of patients were suffering from psychological distress at follow-up and there was a decrease in mean GHQ-12 score too. But the psychological intervention delivered by the psychiatrist to patients of Group B fared significantly better, as reflected by the far better improvements in these two parameters in this group. Our results are in coherence with the already available literature [22-25].

A variety of other respiratory and psychological parameters were also used to make an even fairer assessment of the baseline characteristics and impact of interventions on outcomes. In line with the existing literature, and as an impact of PR programs [26-30], respiratory symptom perception measured in terms of mMRC dyspnea scale, lung function measured by FEV₁ and exercise capacity measured by 6-MWD distance showed improvement in all three groups. Improvement in mMRC dyspnea scale was maximal in Group B, when compared amongst the three groups. SGRQ score is a commonly used scale for studying QOL in various respiratory disorders and has shown comparable validity and reliability for the assessment of COPD patients in the past [26,31-33]. All the 3 groups showed significant improvement in the QOL as measured by SGRQ at follow-up, and the results are consistent with the available literature [24,28]. The maximal improvement in SGRQ was seen in Group B, followed by Group C and A. However, no significant additional improvement in Group B/C in terms of FEV₁ and 6-MWD were seen. Our findings with respect to inter-group

comparisons reflect the fact that psychiatric interventions/ counselling in any form can lead to an improvement in symptom perception, QOL and various mental health parameters, however, the parameters which measure the disability/ limitations due to underlying respiratory disease (like FeV_1 and 6-MWD) do not show any additional improvement. These respiratory parameters, (FeV_1 and 6-MWD) which are actually representative of underlying respiratory problem show improvement with PR programs irrespective of the presence of psychiatric co-morbidities or the use of counselling/ specialist psychiatric management, and the same was seen in our study.

When the psychiatric parameters were analysed, it was seen that PDT score, CSCL score and WHOQOL-Bref-26 score improved significantly at follow-up in all the three groups. There was a significant decrease in distress with patients better placed while coping with difficult situations in daily routines and reported a better overall quality of life. Our findings of improvement in all the three groups validate the role of PR in decreasing the distress and improving the coping strategies and QOL of COPD patients. However, maximum improvement in group B followed by group C and then group A, showed the additional benefit of psychiatric intervention, which is definitely better than the benefit of counselling by a non-expert (Group C) or PR alone (Group A). Incidentally, we could not find any study where serial PDT score was used to evaluate the role of psychological intervention in management of COPD patients. The results with respect to CSCL and QOL from our study are similar as observed previously [27,34,35]. Similarly, as seen in the past, DASS score also improved maximally with specific psychiatric management (group B), again stressing the benefit of definitive treatment by a psychiatrist in patients with psychological distress [36].

In the present study, group A patients were not suffering from any psychological distress at baseline ($GHQ-12 > 3$). Still, we evaluated them on various psychological assessment scores (as used for Group B and C) like PDT, CSCL and WHO-QOL-Bref-26. Apart from significant improvement in respiratory parameters (like 6-MWD, mMRC dyspnea scale, and FEV_1) as a result of PR, the PR programs also contributed to an improvement in psychological scores too. Though the magnitude of improvement can never be equated to a focussed definitive psychiatric intervention or counselling sessions by a non-expert (as seen in Group B and C, Group B > C), however, as seen in the past, PR along with medical management played an important role in improving the psychological wellbeing of our COPD patients irrespective of their psychological status, in addition to their physical health [30,37].

Again, small but significant improvement in psychological scores in Group C patients, though much lesser in intensity than in Group B, focuses on the role of non-experts as counsellors in patients of COPD, till the time expert psychiatric help is available. Simple, easy and quick screening tools like GHQ-12 can be of immense help in our busy out-patient

clinics. Patients can be screened in a short period of time and focused small counselling sessions by the pulmonologists can also help in reducing the psychological burden [30]. We cannot equate the results of counselling by a non-expert with definitive treatment by a mental health expert in any way. However, needless to say, in a country like ours, where seeking mental health is still considered as stigma [38-40], psycho-educative sessions by non-experts can also contribute to the mental wellbeing of such patients avoiding/ awaiting expert psychiatric help.

Studies in the past have found that the presence of psychological co-morbidities lead to non-completion of PR programs [41]. The high success rates of completion of PR in our patients can be because of the baseline screening of mental health issues in all our participants, counselling by the pulmonologist and definitive treatment by the psychiatrist, as per need. This again depicts the importance of such interventions for meeting the very basic idea of PR and management of COPD patients in totality.

Summarizing our findings, PR showed its role in improving the psychological well being of COPD patients. The results were better with directed psycho-educative sessions by non-experts and as expected, best with definitive treatment given by a psychiatrist.

Strength of the study: This is one of the first studies of its kind in India to comprehensively explore the psychological distress and evaluate the role of psychological intervention in patients of COPD after using multiple screening and scoring systems simultaneously.

Limitations of the study: A larger sample size with longer follow-up period might have found a better correlation in some variables that showed a borderline significance, however was not feasible at our end because of time constraints.

Conclusions

The findings of our study suggest looking for psychological co-morbidities in all patients of COPD using simple, quick and easy-to-administer screening/ scoring systems in our out-patient clinics as a routine. Patients found positive on screening should be immediately counselled, and finally evaluated and managed by a psychiatrist, who should be an active participant of comprehensive PR programs. This will aid in mental wellbeing, and also cause additional improvement in exercise capacity, coping skills and quality of life.

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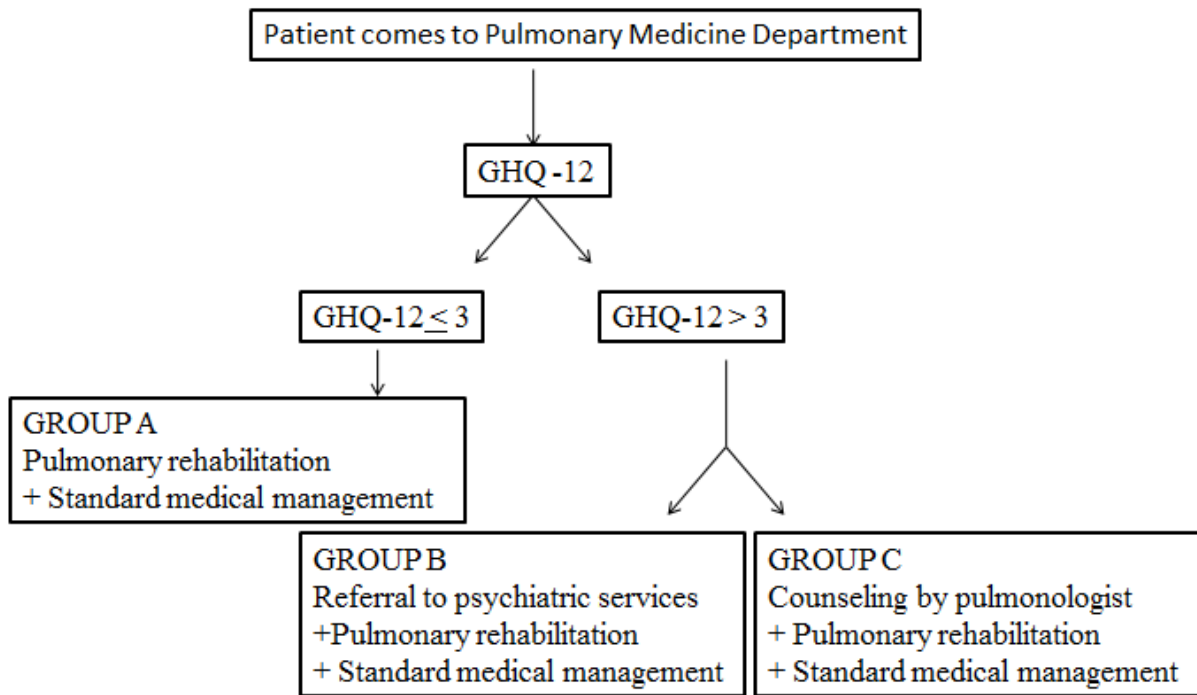


Figure 1. Medical management of the disease.

Table 1. Demographic variables and GHQ-12 score distribution between groups

Variable		Group A (n=26)	Group B (n=26)	Group C (n=26)	p value
Age (in years)		64.12	60.69	60.54	0.37
Gender	Male	25 (96.2%)	22 (84.6%)	22 (84.6%)	0.33
	Female	1 (3.8%)	4 (15.4%)	4 (15.4%)	
Residence	Rural	11 (42.3%)	18 (69.2%)	17 (65.4%)	0.11
	Urban	15 (57.7%)	8 (30.8%)	9 (34.6%)	
Smokers	Yes	22 (84.6%)	23 (88.5%)	23 (88.5%)	0.89
	No	4 (15.4%)	3 (11.5%)	3 (11.5%)	
Co-morbidities	Yes	13 (50%)	14 (53.8%)	14 (53.8%)	0.95
	No	13 (50%)	12 (46.2%)	12 (46.2%)	

NB: Chi-square tests and Kruskal Wallis tests were applied.

Table 2. General Health Questionnaire-12 score at follow-up in Group B and Group C.

Follow up score	Group B (n=26)	Group C (n=26)	p value (Group B versus C)
3	23 (88.5%)	12 (46.2%)	<0.001***
> 3	3 (11.5%)	14 (53.8%)	<0.001***
p value (Baseline versus follow-up)	<0.001***	<0.001***	

n, number; %, percentage; GHQ-12, General Health Questionnaire-12-Hindi version.

NB: Chi-square test was applied. ***p<0.005

Table 3. Distribution of respiratory parameters in the three groups at baseline and at follow-up.

Parameter	Group	Baseline (Mean±SD)	Follow-up (Mean±SD)	p value
SGRQ Score	A	35.02±16.70	23.91±16.88	<0.001***
	B	64.80±21.47	17.93±11.83	<0.001***
	C	58.84±22.76	39.08±17.69	<0.001***
mMRC Scale	A	2.31±1.05	1.46±1.07	<0.001***
	B	3.04±1.15	1±0.94	<0.001***
	C	2.88±1.28	2±1.2	<0.001***
FEV ₁ (in litres)	A	1.31±0.57	1.35±0.58	0.035*
	B	1.18±0.61	1.24±0.62	<0.001***
	C	1.18±0.65	1.25±0.67	<0.001***
6-MWD (in metres)	A	346.96±82.40	361.15±74.55	0.008*
	B	293.42±102.09	321.77±88.69	0.025*
	C	307.58±90.11	325.67±90.79	<0.001***

SD, standard deviation; SGRQ, St. George's Respiratory Questionnaire; mMRC, Modified Medical Research Council; FEV₁, Forced expiratory volume in 1st second; 6-MWD, 6-minute walk distance; *p<0.05; **p<0.01; ***p<0.005.

NB: Kruskal Wallis tests and Wilcoxon Signed Ranks Test were applied.

Table 4. Comparisons of mean changes (from baseline to follow-up) in various scores in the three groups.

Parameter	Mean change from baseline to follow-up (mean \pm SD)			Comparison of changes between the 3 groups*
	Group A	Group B	Group C	
Respiratory Parameters				
SGRQ	11.11 \pm 10.67	46.87 \pm 18.01	19.75 \pm 11.89	B>C A
mMRC Scale	0.85 \pm 0.74	2.04 \pm 0.77	0.88 \pm 0.77	B>C A
FEV ₁ (in litres)	0.04 \pm 0.09	0.05 \pm 0.02	0.05 \pm 0.097	A B C
6-MWD (in metres)	14.19 \pm 25.18	25.23 \pm 49.04	16.63 \pm 12.56	A B C
Psychiatric Parameters				
PDT	0.35 \pm 0.80	4.12 \pm 1.28	1.27 \pm 0.87	B>C>A
CSCL	0.65 \pm 1.47	9.65 \pm 2.61	3.92 \pm 2.50	B>C>A
WHO-QOL-Bref-26	19.31 \pm 18.82	156.77 \pm 43.24	37.85 \pm 25.70	B>C A
DASS	-0.08 \pm 2.97	42.81 \pm 21.18	11.62 \pm 7.63	B>C>A

SD, standard deviation; SGRQ, St. George's Respiratory Questionnaire; mMRC, Modified Medical Research Council Scale; FEV₁, Forced expiratory volume in 1st second; 6-MWD, 6-minute walk distance; PDT, Patient Distress Thermometer; CSCL, Coping Strategy Checklist; WHO-QOL-Bref-26, World Health Organization Quality of Life-Brief-26; DASS, Depression Anxiety Stress Scale; *Turkey HSD post hoc analysis was used.

NB: Wilcoxon Signed Ranks Test, Mann Whitney test were applied.

Table 5. Distribution of psychological scores in the three groups at baseline and at follow-up.

Scale	Group	Baseline (mean \pm SD)	Follow up (mean \pm SD)	p value
PDT	A	2.96 \pm 1.84	2.62 \pm 1.981	0.042*
	B	6.50 \pm 2.14	2.38 \pm 1.58	<0.001***
	C	4.85 \pm 1.52	3.58 \pm 1.45	<0.001***
CSCL	A	9.92 \pm 3.64	9.27 \pm 3.49	0.016*
	B	18.27 \pm 3.52	8.62 \pm 3.76	<0.001***
	C	16.92 \pm 3.77	13 \pm 3.14	<0.001***
WHO-QOL-Bref-26	A	417.54 \pm 33.38	436.85 \pm 42.23	0.001***
	B	260.50 \pm 47.11	417.27 \pm 47.26	<0.001***
	C	297.96 \pm 36.56	335.81 \pm 26.26	<0.001***
DASS	A	3.31 \pm 5.42	3.38 \pm 7.61	0.647
	B	60.12 \pm 29.81	17.31 \pm 14.68	<0.001***
	C	42.31 \pm 19.54	30.69 \pm 14.99	<0.001***

SD, standard deviation; PDT, Patient Distress Thermometer; CSCL, Coping Strategy Checklist; WHOQOL-Bref-26, World Health Organization Quality of Life-Brief-26; DASS, Depression Anxiety Stress Scale; *p<0.05; **p<0.01; ***p<0.005.

NB: Kruskal Wallis tests and Wilcoxon Signed Ranks Test were applied.