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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 comorbidities 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 comorbidity 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 (FEV_1), 6-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 Scale (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, *vs.* baseline ($p<0.001$). mMRC score, SGRQ score, FEV_1, 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 comorbidities 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.

Introduction

Chronic obstructive pulmonary disease (COPD) is a disease that 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 spillover of inflammatory mediators may initiate or worsen comorbid diseases such as osteoporosis, anemia, 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 (QoL) as they affect emotional, social, and physical functioning [3]. A recent Indian-based study has shown a high prevalence of psychiatric comorbidities 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 to be an urgent need for evidence-based psychosocial interventions to promote mental health and optimize 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.

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 before 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 with COPD. Based on clinical experience, it was expected that pulmonary intervention alone would result in about 40% improvement whereas the addition of psychiatric intervention would result in improvement in 75% of 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 were also done. Each patient was initially assessed through cardiopulmonary exercise evaluation. The parameters used for pulmonary assessment were forced expiratory volume in the first second (FEV_1) measured by spirometry [7], 6-minute walk distance (6-MWD) for exercise capacity [8], St. George's Respiratory Questionnaire (SGRQ) [9] and modified medical research council (mMRC) scale for dyspnea [7].

Each patient underwent psychological assessment using the General Health Questionnaire-12 (GHQ-12) Hindi version.[10] 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 three groups of 26 patients each.

Group A consisted of patients with GHQ-12≤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>3 were counseled regarding detailed assessment by a 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, based on psychological morbidity severity. The patient was called for follow-up as needed.

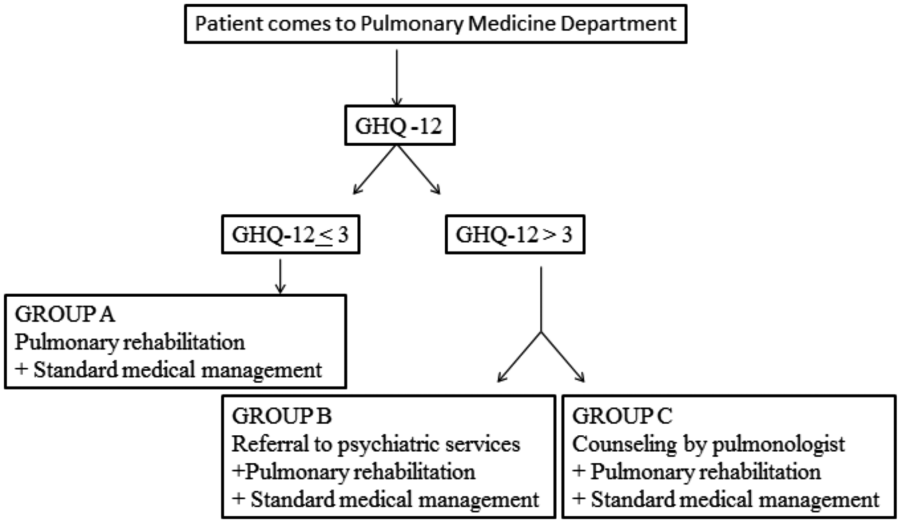

Figure 1. Medical management of the disease. GHQ-12, General Health Questionnaire-12.

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 with treatment. The pulmonologist also delivered structured counseling and educative sessions, encompassing the need for 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 program 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 prescriptions which the patients received in the departmental Pulmonary Rehabilitation Center. It consisted of two supervised exercise sessions per week, each of 1 hour, 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 the 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 Center. Patients were considered 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 the final evaluation.

The psychiatric health of patients was also assessed using various other parameters like Patient Distress Thermometer (PDT) [13], Coping Strategy Checklist (CSCL) [14], World Health Organization-Quality of Life-Brief Hindi Version (WHOQOL-Bref-26) [15], and Depression Anxiety Stress Scales (DASS) [16]. PDT is a modified visual analog 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 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 QoL. DASS measures the degree of depression, anxiety, and stress.

Patients in all three groups were followed up for 8 weeks. All patients were re-assessed at 8 weeks using the same respiratory and psychological parameters/scales *i.e.*, FEV_1, 6-MWD, SGRQ, mMRC scale, GHQ-12, PDT, CSCL, WHOQOL-Bref-26 and DASS-21. Dropouts were excluded, and 26 patients in each group who completed the study requirements as per protocol were finally analyzed.

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

Statistical Analysis

Data analysis included frequency tabulation, the association of variables based on Chi-square, and risk ratio estimates with a 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 analysis of variance. Where data was not normally distributed, variables were compared using the Wilcoxon signed ranks test, Mann-Whitney U test, and Kruskal Wallis test followed by least significant difference or Tukey's post hoc test. All statistical tests were two-sided, and the level of statistical significance was set at 5% ($p<0.05$).

Results

The mean age of the study cohort was 61.78±9.98 years, and all groups were age matched. The majority were males, smokers, and residing in rural areas. Approximately half of the participants had systemic comorbidities. All 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≤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 patients of group B showed improvement in psychological distress (measured by GHQ-12 being ≤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, QoL measured by SGRQ, lung function measured by FEV_1 and exercise capacity measured by 6-MWD distance showed improvement in all 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 FEV_1 and 6-MWD was seen (Tables 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 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).

Table 1. Demographic variables and General Health Questionnaire-12 score distribution between groups.

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

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 (Group B *vs.* C)
≤3	23 (88.5%)	12 (46.2%)	<0.001***
>3	3 (11.5%)	14 (53.8%)	<0.001***
p (baseline vs. follow-up)	<0.001***	<0.001***	

n, number; %, percentage; GHQ-12, General Health Questionnaire-12 (Hindi version); ***p<0.005. Chi-square test was applied.

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

Parameter	Group	Baseline (mean+SD)	Follow-up (mean+SD)	p
SGRQ	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	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***
FEV1 (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. 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±SD)			Comparison of changes between the 3 groups*
	Group A	Group B	Group C	
Respiratory parameters				
SGRQ	11.11±10.67	46.87±18.01	19.75±11.89	B>C≈A
mMRC	0.85±0.74	2.04±0.77	0.88±0.77	B>C≈A
FEV1 (in litres)	0.04±0.09	0.05±0.02	0.05±0.097	A≈B≈C
6-MWD (in metres)	14.19±25.18	25.23±49.04	16.63±12.56	A≈B≈C
Psychiatric parameters				
PDT	0.35±0.80	4.12±1.28	1.27±0.87	B>C>A
CSCL	0.65±1.47	9.65±2.61	3.92±2.50	B>C>A
WHO-QOL-Bref-26	19.31±18.82	156.77±43.24	37.85±25.70	B>C≈A
DASS	-0.08±2.97	42.81±21.18	11.62±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. Wilcoxon signed ranks test and Mann-Whitney test were applied.

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

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

Discussion

Psychological comorbidities are commonly seen in patients with COPD because of the chronicity and nature of the disease, resulting in debility and multisystem involvement [7]. However, despite the GOLD guidelines and various other statuary bodies repeatedly signifying the importance of their identification and management [4,17-19], they have usually remained under-diagnosed and undertreated. Henceforth, because of the paucity of literature, various agencies from time to time have recommended the need for undertaking research studies to identify psychological comorbidities 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 comorbidities, 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 comorbidity and decide further course of action. It served as an acceptable scoring system for our patients as it is simple, valid, and easily administered by even a pulmonologist in the shortest time frames in our busy outpatient 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 groups 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 the extent of improvement in psychological distress was maximal in group B, where the management was done by the psychiatrist. The counseling by the pulmonologist in group C also yielded encouraging results as a lesser number of patients were suffering from psychological distress at follow-up and there was a decrease in mean GHQ-12 score too. However, the psychological intervention delivered by the psychiatrist to patients of group B faired 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 FEV_1, and exercise capacity measured by 6-MWD showed improvement in all three groups. Improvement in the mMRC dyspnea scale was maximal in group B when compared among 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 three 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 groups C and A. However, no significant additional improvement in group B/C in terms of FEV_1 and 6-MWD was seen. Our findings with respect to inter-group comparisons reflect the fact that psychiatric interventions/counseling in any form can lead to an improvement in symptom perception, QOL, and various mental health parameters; however, the parameters that 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) that are actually representative of underlying respiratory problems show improvement with PR programs irrespective of the presence of psychiatric comorbidities or the use of counseling/specialist psychiatric management, and the same was seen in our study.

When the psychiatric parameters were analyzed, it was seen that the PDT score, CSCL score, and WHOQOL-Bref-26 score improved significantly at follow-up in all 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 three groups validate the role of PR in decreasing distress and improving the coping strategies and QOL of COPD patients. However, the 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 counseling 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 the management of COPD patients. The results concerning CSCL and QOL from our study are similar as observed previously [27,34,35]. Similarly, as seen in the past, the 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 groups B and C) like PDT, CSCL, and WHO-QOL-Bref-26. Apart from the 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. Though the magnitude of improvement can never be equated to a focused definitive psychiatric intervention or counseling sessions by a non-expert (as seen in groups B and C, group B>C), 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 counselors 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 outpatient clinics. Patients can be screened in a short period of time, and focused small counseling sessions by pulmonologists can also help in reducing the psychological burden [30]. We cannot equate the results of counseling 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 a stigma [38-40], psycho-educative sessions by non-experts can also contribute to the mental well-being of such patients avoiding/awaiting expert psychiatric help.

Studies in the past have found that the presence of psychological comorbidities leads 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, counseling by the pulmonologist, and definitive treatment by the psychiatrist, as per need. This again depicts the impor-

tance 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 psychological distress and evaluate the role of psychological intervention in patients with COPD after using multiple screening and scoring systems simultaneously.

Limitations of the study

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

Conclusions

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

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