International Journal of Science and Healthcare Research
[Indexed, Peer-Reviewed Journal]
Vol. 11; Issue: 2; April-June 2026
Website: ijshr.com
Original Research Article *ISSN: 2455-7587*

Correlation Between Knowledge of COPD, Health Related Quality of Life, Level of Physical Activity and Dyspnea Score in Patients with COPD

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DOI: https://doi.org/10.52403/ijshr.20260204

ABSTRACT

Purpose: This study evaluated correlation between knowledge of COPD, health related quality of life, level of physical activity and dyspnea score in patients with COPD from Haryana as these factors are known to influence disease progression and further the BCKQ score were compared across different sociodemographic variables, including locality, previous disease knowledge, smoking status and level of education.

Materials and Methods: Prospective cross-sectional study was done on 200 stable COPD patients in a tertiary care teaching hospital. The Bristol COPD Knowledge Questionnaire was used to evaluate knowledge of the condition. St. George Respiratory Questionnaire (SGRQ) was used to measure health-related quality of life. IPAQ (International Physical Activity Questionnaire) was used to measure physical activity, while the Modified Borg Scale was used to measure shortness of breath.

Results: BCKQ score was negatively correlated with SGRQ sub-components and also with SGRQ total score, with significant Pearson correlation SGRQ symptom (r = -.156; $p<0.05$), SGRQ activity (r = -.147; $p<0.05$), SGRQ impact (r = -.214; $p<0.05$) and with SGRQ total score (r = -.221±; $p<0.01$). Weak Positive correlation with significant Pearson correlation was found between IPAQ and BCKQ score (r = 0 .146, $p<0.05$). Weak negative correlation with significant Pearson correlation was found between dyspnea score and BCKQ score (r= -0.235, $p<0.01$).

Conclusion: In conclusion, the study highlights that increase in disease knowledge is significantly associated with better health-related quality of life, higher physical activity levels, and reduced dyspnea.

Keywords: COPD knowledge, previous disease knowledge, locality, Education and knowledge.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD), is a common lung disease that limits airflow and make breathing more difficult and is sometimes referred as chronic bronchitis or emphysema
with symptoms including fatigue, wheezing, breathing difficulties, and coughing, often with phlegm.[1] The most common risk factors linked to the development of COPD include smoking, genetic and environmental factors including pollution, exposure to passive smoking and occupational exposure to dust and fumes.[2]

At a global level, COPD prevalence in 2020, across both males and females, was estimated to be 10.6%, which translates to 480 million cases. [3,4] In India, the prevalence of COPD among non-smokers varied between 1.6 and 26.6 % And in Haryana prevalence of COPD has been reported to be 8.02 % in individuals above 35 years of age. [5,6]

The management of COPD is both through pharmacological and non-pharmacological methods. [7,8,9] Along with pharmacological treatment, pulmonary rehabilitation which incorporates patient education, exercise training, and psychological intervention is found to be cost-effective. Pulmonary rehabilitation (PR)lowers hospitalizations, improves health-related quality of life, enhances exercise capacity, and lessens dyspnea. pulmonary rehabilitation is comprehensive; it may be possible to improve patient activation to help with disease self-management. Proper patient education improves health-related quality of life and reduces hospitalizations for COPD patients. [7,9]

Studies have shown that patient education regarding their condition, warning signs and symptoms, pathology, and treatment is believed to be the key element of successful treatment of COPD. Self-management therapies for COPD are beneficial in assisting patients to deal with increasing symptoms and, consequently, to make accurate choices on managing the symptoms of their chronic condition.

Thereby the present study evaluated the knowledge of (COPD) and tested the hypothesis that whether there is any correlation between knowledge of COPD, health related quality of life, level of physical activity and dyspnea score in patients with COPD.

Further, correlation of COPD disease knowledge was carried out with sociodemographic factors including educational level, region of living, previous diseases education, duration of diseases, smoking or occupational dust exposure.

MATERIALS & METHODS

Study Design:

The prospective cross-sectional study was conducted in a tertiary care teaching hospital from July 2024 to June 2025. Participants clinically diagnosed with COPD while waiting to see their physician on clinical days were recruited in study. The study was conducted after ethically approval by Institutional Biomedical Research Ethics Committee (EC/NEW/INST/2022/HR/0189) and from Clinical Trial Registry-India (CTRI/2024/09/073881 dated 13/09/2024).

Sample size:

Sample size was determined using the single population proportion formula, sample size= $Z_{(1-\alpha/2)}^2 \times p(1-p)/d^2$; where $Z_{(1-\alpha/2)}$ = standard normal variate (at 95% Confidence interval=1.96) and d (absolute error in precision for the current study) =0.05 was taken based on the prevalence of COPD among Haryana to be (5.6-9.4 per thousand), resulting in a minimum required sample size of 130.8.[10] Thereby, sample size of 200 was determined for present study.

Participants:

A total of 200 clinically diagnosed COPD patients were enrolled in study using convenience sampling. Patients in age group of ≥ 40 years, both male and female, on medications for more than six months, were included. Patients who were not co-operative, diagnosed with major psychiatric disorders or severe cognitive impairments.

Patients with confusion secondary to exacerbation of COPD were excluded. Study participants were explained about the purpose and procedure of study. Following this, written informed consent was obtained from willing participants.

Outcome measures:

A detailed demographic information of all participants was collected mentioning age category, gender, educational qualification, marital status, occupation, level of physical activity, duration of COPD, history of smoking and substance abuse. Subjects enrolled in study were asked to first fill out BCKQ (Bristol COPD knowledge questionnaire) Correct responses to questions were scored 1 and 0 otherwise, SGRQ (St. George respiratory questionnaire) the SGRQ has 50 items distributed into three categories: symptoms, activity, and impact, with 76 weighted responses. The lowest possible weight is 0, and the highest is 100. Each item has an empirically derived weight, and a total score is calculated. [11,12] The IPAQ is suitable for adults between 15 and 69 years of age. Results can be reported in categories (low activity levels, moderate activity levels or high activity levels) or as a continuous variable (MET minutes a week).[13] MET minutes represent the amount of energy expended carrying out physical activity and Borg dyspnea scale, this rating scale used to report how strong your perception is. It can be exertion, pain or something else. First look at the words on the scale, and then the numbers. Of these ten (10) or "Extremely strong", "Maximal" is a very important intensity level. This is the most intense perception or feeling you have ever had.

Statistical Analysis

Data was tabulated in master chart. Data was analysed using statistical analysis software SPSS 24. Continuous variables are presented as mean ± standard deviation. Categorical variables were expressed as frequencies and percentages.

Pearson correlation test was performed to calculate the correlation between BCKQ with SGRQ, IPAQ and modified borg scale.

Independent sample t-test was used to evaluate the effect of sociodemographic factors (locality, duration of disease, smoking /occupational dust exposure and previous disease knowledge) on BCKQ, SGRQ, IPAQ and dyspnea mean scores. One-way analysis of variance (ANOVA) was used to assess the effect of education level on BCKQ, SGRQ, IPAQ, and dyspnea mean scores. Bonferroni post hoc multiple comparison test was performed for pairwise comparisons.

A p-value of <0.05 was considered statistically significant.

RESULT

The enrolment of COPD participants is shown in figure-1. Further details of mean ± SD of demographic details and BCKQ, SGRQ, IPAQ, dyspnea score of all the participants shown in table-1 and table-2.

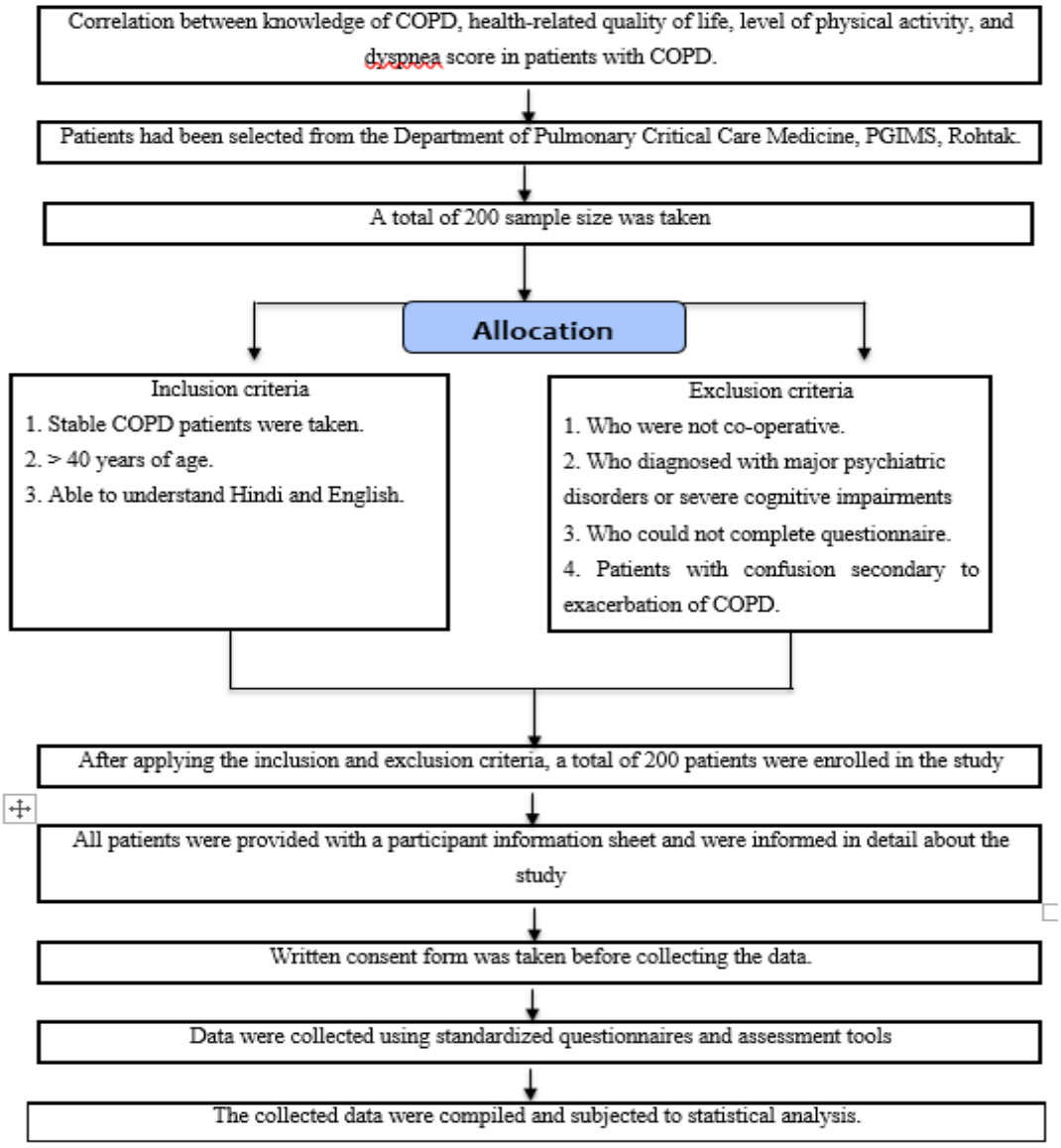

Figure 1. Study flow diagram.

Table 1: Mean± SD and distribution of participants according to demographics:

	Male	**Female**
Age (years)	65.29±7.97	64.15±8.79
Height (cm)	165.79±9.18	158.24±6.95
Weight (kg)	63.01±7.98	58.36±9.02
Urban(n/%)	65/46%	14/23.7%
rural(n/%)	76/53.9%	45/76.3%
uneducated(n/%)	23/16.3%	37/62.7%
primary school(n/%)	93/66.0%	19/32.2%
high school(n/%)	13/9.2%	2/3.4%
senior secondary(n/%)	12/8.5%	1/1.7%
undergraduate(n/%)	0/0.0%	0/0.0%
smoker(n/%)	99/76.2%	32/54.2%
Nonsmoker(n/%)	42/29.8%	27/45.8%
duration of diseases ≥10(n/%)	119/84.4%	46/78.0%
duration of diseases ≤10(n/%)	22/15.6%	13/22.0%
previous disease knowledge(n/%)	46/32.6%	16/27.1%
No previous disease knowledge(n/%)	95/67.4%	43/72.9%

Table 2: Mean± SD of BCKQ, SGRQ, IPAQ and dyspnea score:

	Male	Female
BCKQ score	16.21±5.17	13.92±5.16
SGRQ (total score)	61.97±18.44	63.82±19.77
SGRQ symptom	68.98±21.73	69.34±5.16
SGRQ activity	74.62±18.24	75.45±20.06
SGRQ impact	51.55±20.43	55.24±21.21
IPAQ (total score)	2964.37±60011.16	2825.18±7535.98
No activity	31/22.0%	15/25.4%
Mild	37/26.2%	20.33.9%
Moderate	43/30.5%	14/23.7%
High	30/21.3%	11/16.9%
Dyspnea (total score)	6.21±2.297.3	7.37±2.25
Slight	9/6.4%	2/3.4%
Moderate	14/9.9%	3/5.1%
Somewhat severe	5/3.5%	0/0.0%
Severe	34/24.1%	9/15.3%
Very severe	58/41.1%	26/44.1%
Extremely severe	5/3.5%	4/6.8%
Maximal	16/11.3%	15/25.4%

BCKQ score was negatively correlated with SGRQ sub-components and also with SGRQ total score. Weak Positive correlation with significant Pearson correlation was found between IPAQ and BCKQ score. Weak negative correlation with significant pearson correlation was found between dyspnea score and BCKQ score. (Table 3)

Table 3: Correlation of BCKQ score with SGRQ, IPAQ and dyspnea score:

	BCKQ score		
	SGRQ total score	**IPAQ score**	**Dyspnea score**
r-value	-0.221	0.146	-0.235
p-value	0.0002**	0.04*	0.01*

*Measurements are statistically significant at P<0.05; **Highly significant at P<0.01.

correlation of BCKQ with SGRQ, IPAQ and Dyspnea score is also shown in scatter plot, (Figure 2,3,4)

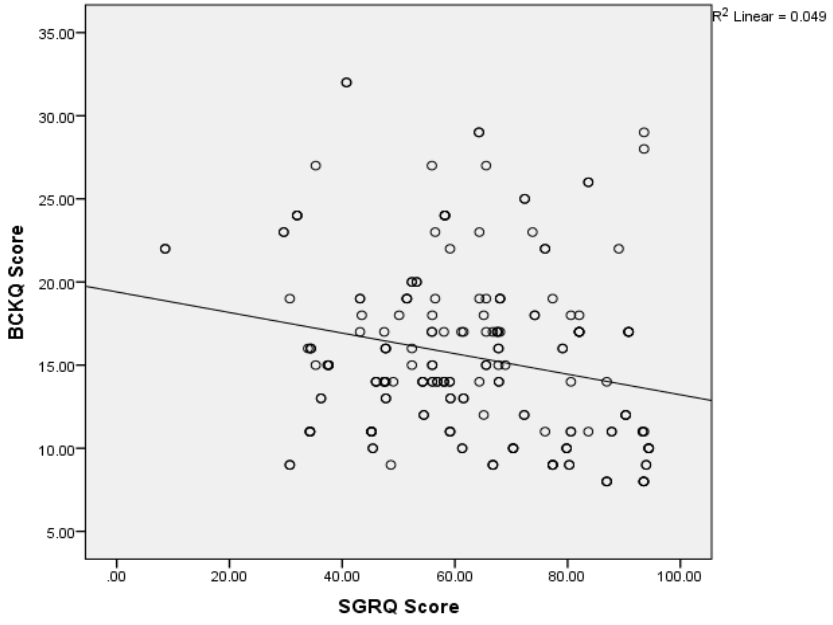

Figure 2. scatter plot of correlation between BCKQ and SGRQ score

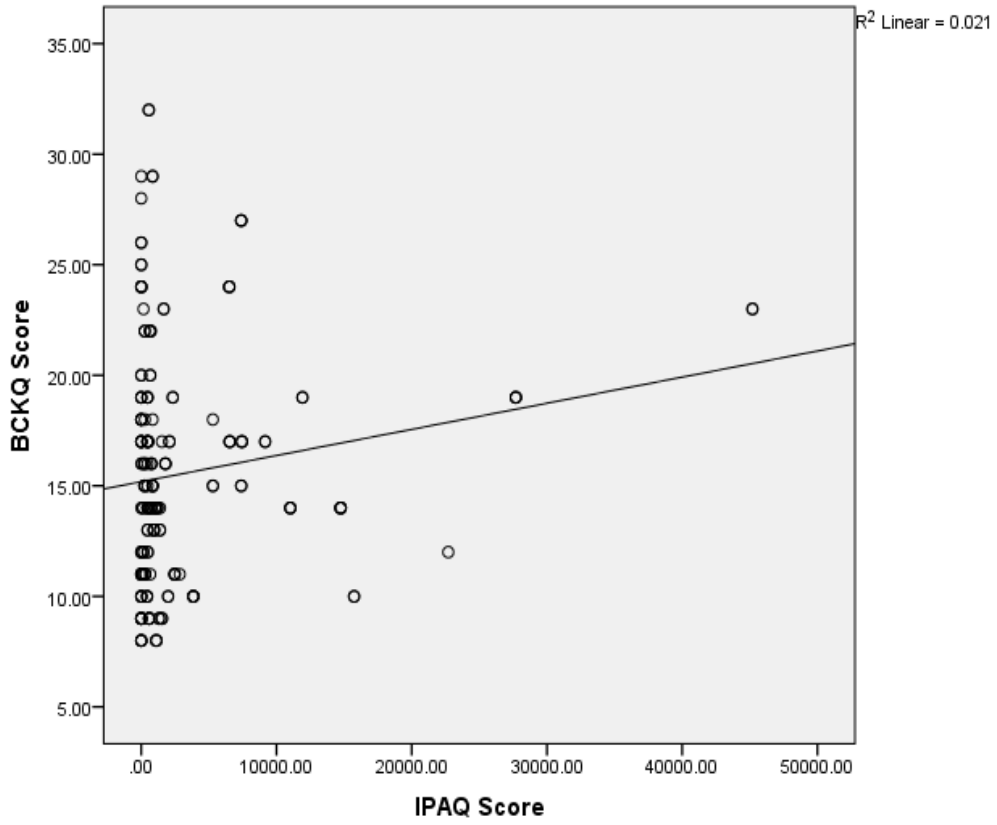

Figure 3. scatter plot of correlation between BCKQ and IPAQ score.

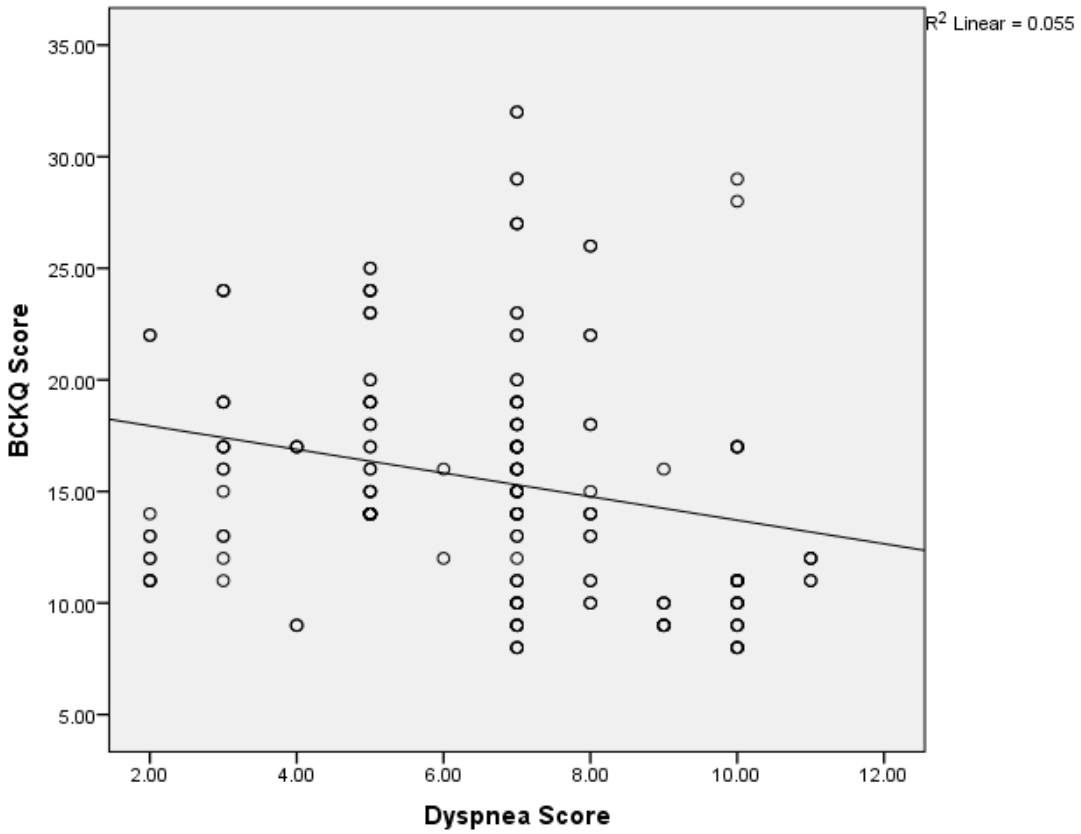

Figure 4. scatter plot of correlation between BCKQ and Dyspnea score.

Independent sample t-test and ANOVA used to compare BCKQ score with sociodemographic variables. Analysis indicated that smokers had high BCKQ score mean than non-smokers but non-significant. BCKQ mean score of urban participants is higher than rural participants with statistically significant mean difference. Results showed statistically significant difference in BCKQ score between previous disease knowledge participants and those who did not have previous disease knowledge. It suggests that previous disease knowledge strongly associated with higher BCKQ score. (Table 4)

Table 4: BCKQ, SGRQ, IPAQ and dyspnea score with reference to sociodemographic characteristics:

	BCKQ score	**SGRQ score**	**Dyspnea score**	**IPAQ score**
smoker (mean±SD)	15.969±5.469	66.530±16.975	6.870+ 2.175	2893.667+7094.956
non-smoker(mean±SD)	14.710±4.759	54.887±19.861	5.942+2.514	2979.587+5133.949
t-value	1.617	4.344	2.717	-0.089
p-value	0.107^{NS}	0.0001**	0.007**	0.929^{NS}
rural (mean±SD)	14.041±4.788	66.901±18.104	6983+2.422	3111.413+7452.619
urban(mean±SD)	17.823±5.146	44.57±17.968	5.886+2.032	2635.201+4614.370
t-value	5.301	4.255	3.333	0.508
ssp-value	0.0001**	0.0001**	0.001**	0.612^{NS}
Previous disease knowledge (mean±SD)	20.823±4.470	56.434±17.369	5.565+1.834	5289.308+9663.198
without previous disease knowledge(mean±SD)	13.159±3.593	65.244±18.85	6.993+2.403	1860.325+3950.059
t-value	12.903	3.13	4.165	3.566
p-value	0.0001**	0.003**	0.0001**	0.0001**
Duration of disease ≤10 years(mean±SD)	15.036±5.077	61.659±17.748	6.521+2.362	3473.984+7002.394
Duration of disease ≥10 years(mean±SD)	17.886±5.524	66.369±23.088	6.686+2.220	327.271+520.708
t-value	2.969	1.338	0.378	2.652
p-value	0.003**	0.182^{NS}	0.706^{NS}	0.009**

*Measurements are statistically significant at P<0.05; **Highly significant at P<0.01. NS = Non-significant.

Uneducated participants had the lowest mean score, whereas patients with primary education scored moderately higher. Those with higher education levels, such as high school and senior secondary school, demonstrated the highest knowledge scores. The difference across educational groups was found to be statistically significant (F = 20.726, p = 0.0001)

Same tests were used to compare SGRQ, IPAQ and Dyspnea score with sociodemographic variables. There is statistically significant difference of SGRQ score between smokers and non-smokers, rural and urban residents, with previous disease knowledge and without previous disease knowledge and education level. Rural, non-smokers, previous disease knowledge mean score for SGRQ is more than urban, smokers, without previous disease knowledge population which indicate rural, non-smoker and population without previous disease knowledge have better quality of life. Not statistically significant between ≤10 years and ≥10 years duration of disease but patient diagnosed with disease from ≤10 years have low mean score of SGRQ.

There is no statistically significant difference (p≥0.05) between the IPAQ mean score of smokers and non-smokers, rural and urban population. Individuals with prior knowledge of their disease have significantly higher physical activity levels (p = 0.0001) than those who have not received prior disease knowledge. Those with a shorter disease duration (≤10 years) are significantly more active than those with a longer duration (p = 0.009). Disease progression limits activity over time.

Smokers, rural population and Uneducated individuals show significantly higher dyspnea than non-smokers, urban educated groups ($p< 0.01$). People with knowledge of their disease have significantly lower dyspnea scores ($t= 4.165$, $p = .0001$). There is no significant difference in dyspnea scores based on disease duration ($p = .706$) (Table 4).

Table 5: Post hoc analysis of BCKQ, SGRQ, IPAQ and dyspnea score Mean ± SD with reference to level of education:

	BCKQ score	SGRQ score	Dyspnea score	IPAQ score
uneducated(mean±SD)	11.967±3.594[a]	70.407±17.801[a]	8.283±1.668[a]	1495.917±3514.442[a]
primary school(mean±SD)	16.420±5.056[b]	59.840±17.919[b]	5.804±2.245[b]	3907.678±7828.593[a]
high school(mean±SD)	19.533±4.764[c]	57.835±17.528[b]	5.600±1.724[b]	3159.467±6002.709[a]
senior sec. and above(mean±SD)	19.769±4.764[c]	54.501±22.498[b]	6.077±2.216[b]	758.007±819.050[a]
F-value	20.726	5.757	20.535	2.376
P-value	0.0001**	0.001**	0.0001**	0.071[NS]

BCKQ, SGRQ, IPAQ and dyspnea score for different education level (Values with same superscript are non-significant, while those with different superscript are highly significant).

The results of bonferroni post hoc analysis (Table 5) between different education groups (uneducated, primary school, high school and senior secondary school) showed by using superscripts. Overall, results showed highly significant difference was found in BCKQ, SGRQ and dyspnea score between different education groups but IPAQ score was non-significant.

DISCUSSION

This study aims to examine the correlation between BCKQ, IPAQ, SGRQ, and dyspnea scores in order to determine how patients' level of knowledge is associated with their quality of life, physical activity, and dyspnea. In addition, the study also investigates the influence of various sociodemographic factors on these four variables.

In our study, there was negative Pearson correlation between BCKQ score and SGRQ or its sub-components shows that with increase in BCKQ score, health related quality of life also increases. (Table 3)

These findings are supported by previous study, by Lee SH et al. (2020) concluded that better knowledge leads to improved pulmonary function and reduced depression in COPD patients.[14]

Another study by Yang et al. (2019) study, showed that the disease knowledge of COPD was positively correlated with the total points on the COPD Self-Management Behavior Scale.[9]

All these studies suggest that good disease knowledge is associated with better quality of life and health status in COPD patients, as observed in the present study.

The results of our study shows that individuals who had knowledge about the disease have better physical activity level. Although the correlation is weak. In a study by Stevens et al. negative correlation was found between physical activity level and environmental pollution. This indicate that patients with COPD who had more knowledge about their health status have improved physical activity level.[15]

Significant negative Pearson correlation was found between dyspnea score and BCKQ score ($r = -0.235$, $p<0.01$). This indicates that increase in knowledge about disease and management can help the patient to manage their dyspnea and fatigue, suggesting a meaningful relationship between disease knowledge and management of respiratory symptoms in COPD patients. (Table 3)

A previous study by Çevirme et al. suggest that a partial improvement in dyspnea and a significant improvement in chronic care management among COPD patients when patients received illness-related education through EBIP.[16]

The comparison of BCKQ scores with prior knowledge had significantly higher COPD knowledge that is determined by BCKQ score. Although smokers had a slightly higher mean BCKQ score compared to non-smokers, this difference was not statistically significant, this might be due to the other factors that non-smokers might have disease duration more than ten years and locality of the participant who were smokers was urban. (Table 4)

A study by Nyberg A et al. in which Healthcare practitioners who received the digital education programme also gained more knowledge about COPD.[17]

In the present study, knowledge of COPD and education level are significantly correlated. There was a statistically significant difference between educational groups, based on the ANOVA results. Overall, the findings show that more education level improves knowledge of COPD as assessed by the BCKQ. The possible reason behind the results that in general, health literacy is improved by higher education.

People living in rural areas, smokers, and those who had no previous knowledge about their disease had poorer health-related quality of life (SGRQ scores) than urban, non-smoker and had previous disease knowledge (M=56.434). there was not statistically significant difference on the basis of disease knowledge.

Hassan HA et al. study shows the benefits of early smoking cessation and improved health related quality of life.[18]

In study conducted by Papadopoulos G et al. observed that the CCQ scores were reduced with smoking cessation, while SF-12 score was increased. Thus, this study is also supporting our findings.[19]

A study by Ahmed MS et al. The study demonstrated that worsening symptoms, increased disease duration, and smoking had a negative impact on HRQOL.[20]

The findings of the present study are consistent with previous research, which also demonstrated similar results. Therefore, it can be stated that health-related quality of life tends to worsen with increasing disease duration, limited disease knowledge, low awareness, and in patients who are smokers.

The ANOVA results highlight that health-related quality of life improves with higher education levels, with uneducated individuals experiencing the reduced health-related quality of life.

A study by van der Vlegel M et al. assessed the relationship between health care utilization and educational attainment. Compared to those with higher levels of education, those with lower level of education reported lower HRQoL and more problems.[21]

This could be possibly due to the reason that individuals with higher education have better access to resources, healthier lifestyles, and greater health literacy, allowing them to manage chronic conditions more effectively.

The comparison of IPAQ scores according to demographic characteristics shows no statistically significant difference between smokers and non-smokers, and between rural and urban populations. However, individuals with prior knowledge of their disease demonstrate significantly higher physical activity levels than those without such knowledge. Similarly, participants with a shorter disease duration are significantly more active compared to those with a longer duration, suggesting that disease progression limits activity over time.

Wu YK et al. assessed the relationships between self-reported COPD and physical activity, Smokers are more likely to experience airflow obstruction than physically active non-smokers, regardless of their degree of physical activity.[22]

A study by Li M, Gao W. observed that after rehabilitation, the quality of life was higher for non-smoking patients than for smokers.[23]

The comparison of IPAQ scores across education levels showed no statistically significant difference ($F = 2.376$, $p = 0.071$), though the values approached significance.

Kari JT et al. study examined whether educational attainment, measured by years of education, is related to adulthood physical

activity in terms of overall physical activity. The findings indicated that education may be a factor leading to higher physical activity and thus this study supporting our findings.[24]

In study of Shaw BA an age-related decline in physical activity was observed, steeper among low-education individuals. Different intervention strategies for groups of different socioeconomic status may be needed.[25]

Dyspnea scores were significantly higher among smokers, rural residents, uneducated participants, and those without prior knowledge about their disease.

A study by Sharma et al. (2019) supporting our findings that dyspnea gets worse as duration of disease progress and in uneducated patients.[10]

The study found a strong correlation between dyspnea scores and education level. These results suggest that while education is linked to less severe symptoms of dyspnea, but differences between educated levels are not statistically significant, uneducated people had more severe symptoms.

This finding is supported by a cross-sectional study by a cross-sectional study by Gjerdevik M et al. in which Adults with COPD, who had lower educational attainment had higher rates of emphysema.[26]

CONCLUSION

In conclusion, the study highlights that greater knowledge about COPD is significantly associated with better health-related quality of life, higher physical activity levels, and reduced dyspnea led us to accept the alternate hypothesis. These findings underscore the importance of structured educational intervention, smoking cessation support, and targeted programs to address rural–urban disparities and empower patients in effectively managing COPD.

Declaration by Authors

Ethical Approval: Biomedical research committee, Pt. B. D. Sharma PGIMS/UHS, Rohtak (EC/NEW/INST/2022/HR/0189).

Source of Funding: No funding sources

Conflict of Interest: No potential conflict of interest relevant to this article.

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How to cite this article: Sushma, Gitanjali Sikka, Pawan K Singh, Indu Bhola, Jaspreet Kaur, Sheetal. Correlation between knowledge of COPD, health related quality of life, level of physical activity and dyspnea score in patients with COPD. *Int. J. Sci. Healthc. Res.* 2026; 11(2): 25-36. DOI: *10.52403/ijshr.20260204*

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