Original Article

Assessing the impact of a respiratory care bundle on health status and quality of life of chronic obstructive pulmonary disease patients in Jordan: A quasi-experimental study

Ahmad R. Saifan, Rami A. Elshatarat[1], Murad A. Sawalha[2], Fadi Khraim[3], Ateya M. Ibrahim[4,5], Donia E. Zaghamir[4,6], Zyad T. Saleh[7], Khaldoun M. Hamdan[8], Mohannad E. AbuRuz[1], Ahmad M. Al-Bashaireh[9]

Department of Nursing, Applied Science Private University, Amman, Jordan, [1]Department of Medical and Surgical Nursing, College of Nursing, Taibah University, Madinah, Saudi Arabia, [2]Department of Maternal, Child and Family Health Nursing, Faculty of Nursing, The Hashemite University, Zarqa, Jordan, [3]College of Nursing, Qatar University, Doha, Qatar, [4]Department of Nursing, College of Applied Medical Sciences, Prince Sattam Bin Abdulaziz University, AlKharj, Saudi Arabia, [5]Family and Community Health Nursing, Faculty of Nursing, Port Said University, Egypt, [6]Pediatric Nursing, Faculty of Nursing, Port Said University, Egypt, [7]Department of Clinical Nursing, School of Nursing, The University of Jordan, Amman, Jordan, [8]Faculty of Nursing, Al-Ahliyya Amman University, Amman, Jordan, [9]Faculty of Health Science, Higher Colleges of Technologies, Fujairah, United Arab Emirates

Abstract:

BACKGROUND: This study aimed to evaluate the effectiveness of a respiratory care bundle, including deep breathing exercises, incentive spirometry, and airway clearance techniques, on the quality of life (QoL) of chronic obstructive pulmonary disease (COPD) patients in Jordan.

MATERIALS AND METHODS: A quasi-experimental study design and convenience sampling method was used to recruit 120 COPD patients, with 54 in the intervention group and 66 in the control group. The intervention group received additional respiratory care bundle training, while the control group received only discharge instructions and an education program. The St. George's Respiratory Questionnaire (SGRQ-C) was used to assess participants' QoL before and after the intervention. Independent t-tests, paired t-tests, and analysis of covariance (ANCOVA) analysis were used to analyze the data.

RESULTS: The study found no significant differences between patients' characteristics, health status, and SGRQ-C scores between the two groups at baseline. After the intervention, there were statistically significant differences in all SGRQ-C subscales, which were lower in the intervention group compared to the control group. The paired t-test showed significant reductions in all SGRQ-C symptoms components (t = 7.62, P < .001), activity component (t = 7.58, P < .001), impact component (t = 7.56, P < .001), and total scores post-intervention (t = 7.52, P < .001) for the intervention group. The ANCOVA analysis showed significant differences in scores of SGRQ-C components and total scores (f = 11.3, P < .001) post-intervention between the two groups.

CONCLUSION: The study's findings suggest that providing additional respiratory care bundle training for COPD patients can significantly improve their QoL, as measured by the SGRQ-C scores. The respiratory care bundle intervention was effective in reducing COPD symptoms and improving the QoL of COPD patients. Healthcare providers should consider implementing respiratory care bundles as part of COPD management to improve patients' outcomes.

Keywords:
Chronic obstructive, pulmonary disease, quasi-experimental, respiratory therapies

Introduction

Respiratory diseases, including chronic obstructive pulmonary disease (COPD), are major contributors to global morbidity and mortality, affecting millions. Dyspnea, a key COPD symptom, significantly impacts patients' quality of life, culminating in

Address for correspondence:
Dr. Ateya M. Ibrahim,
Department of Nursing,
College of Applied Medical
Sciences, Prince Sattam
Bin Abdulaziz University,
AlKharj, Saudi Arabia.
E-mail: a.eleglany@psau.
edu.sa

How to cite this article: Saifan AR, Elshatarat RA, Sawalha MA, Khraim F, Ibrahim AM, Zaghamir DE, *et al.* Assessing the impact of a respiratory care bundle on health status and quality of life of chronic obstructive pulmonary disease patients in Jordan: A quasi-experimental study. J Edu Health Promot 2024;13:191.

high healthcare costs and mortality.[1-3] As COPD prevalence escalates, effective interventions are imperative.[1,3] Breathlessness curtails activity induces anxiety and restricts independence. Sleep disturbances due to physiological changes, hypercapnia, and inflammation worsen COPD patients' well-being. Insomnia's prevalence amplifies health-related quality of life concerns. Frequent hospitalizations for exacerbations underline COPD's burden.[2-4] COPD's recurrent symptoms engender fatigue, reduced activity, and absenteeism, necessitating interventions to enhance well-being.[3,5,6]

COPD management, crucial for preventing exacerbations and enhancing patients' quality of life (QoL), encompasses a combination of pharmacological and nonpharmacological measures, including nutrition assessment, rehabilitation, physical activity, and oxygen therapy.[2,3,7] However, ensuring coordinated and timely delivery in busy clinical environments can be challenging. The use of recommended respiratory care bundles proves advantageous, providing an evidence-based framework to administer care for COPD patients effectively. These bundles facilitate timely interventions, thereby improving clinical outcomes and reducing healthcare costs.[2,8,9]

A respiratory care bundle amalgamates interventions to enhance treatment outcomes and QoL in respiratory conditions. For COPD patients, recommended interventions vary based on disease severity and care settings.[2,3,10] Common components encompass smoking cessation advice, bronchodilators, corticosteroids, oxygen therapy, exacerbation assessment, and patient education. Furthermore, earlier research has highlighted various interventions incorporated within respiratory care bundles and frequently applied to individuals with COPD. Notably, among these interventions, practices such as deep breathing exercises, incentive spirometry, and airway clearance techniques have demonstrated feasibility and efficacy in managing COPD symptoms and enhancing the QoL for affected patients.[1-3,7,10] Deep breathing exercises are a simple but effective intervention that can help patients with COPD improve respiratory function and reduce dyspnea.[10-12] Randomized controlled trials found that a program of deep breathing exercises significantly improved pulmonary function and reduced dyspnea in patients with moderate to severe COPD.[13] Incentive spirometry is another intervention that can help patients with COPD to improve respiratory function and reduce dyspnea. Several studies have demonstrated the efficacy of incentive spirometry in reducing dyspnea and improving respiratory function in patients with it.[11,14,15] Airway clearance techniques are a common approach of the respiratory care bundle that can help patients with COPD improve respiratory function and reduce dyspnea. Airway clearance techniques can include coughing, chest physiotherapy, and vibration therapy. These interventions help clear mucus and secretions from the lungs, improving respiratory function and reducing dyspnea.[10,16,17] These interventions underscore the value of respiratory care bundles in COPD management, offering tailored strategies to enhance QoL.

Respiratory therapists and nurses are usually responsible for educating patients about the importance of performing these different interventions, providing guidance on performing them correctly, monitoring their progress, and adjusting the plan as needed. Additionally, they work with patients to develop personalized discharge plans that focus on continuing these interventions at home.[3,18-20]

International studies showed that respiratory care bundles had been developed to improve the management of dyspnea in COPD patients. However, implementing respiratory care bundles is challenging due to healthcare professionals' lack of awareness and knowledge and the lack of standardization in managing dyspnea in patients with COPD.[18,20-22]

Research on the use of respiratory care bundles in Arab countries, notably Jordan, remains scarce, and their efficacy in ameliorating dyspnea in Jordanian COPD patients remains unexplored. The study is particularly relevant and needed in the specific country of Jordan due to several reasons related to the country's healthcare landscape and the prevalence of COPD among its population. Jordan, like many countries, faces the challenges of providing effective and efficient healthcare services to its citizens. Given the unique healthcare context of Jordan, it becomes essential to explore interventions that can improve the health status and quality of life of COPD patients. COPD is a global health concern, and its prevalence is affected by various factors including smoking, air pollution, and genetics. In the case of Jordan, a specific understanding of the prevalence and impact of COPD is crucial due to potential risk factors like tobacco smoking, occupational exposure, and indoor air pollution. Research specific to the Jordanian population can provide insights into the burden of COPD and the need for tailored interventions. The impact of COPD can be influenced by cultural practices, socioeconomic factors, and access to healthcare services. These factors can vary significantly from one country to another. A study conducted in Jordan can explore how these factors interact with respiratory care bundles and their effectiveness, thus offering insights into the unique challenges and opportunities in managing COPD in the Jordanian context. The availability of healthcare resources, facilities, and infrastructure in Jordan

may impact the implementation and effectiveness of interventions such as respiratory care bundles. This study can shed light on the feasibility and adaptability of such interventions within the existing healthcare system of Jordan. Policymakers, healthcare providers, and researchers in Jordan rely on local evidence to make informed decisions about healthcare policies and interventions. By conducting a study within the Jordanian population, this research provides valuable data that can guide evidence-based practices and policies for COPD management in the country. While COPD is a global concern, research conducted in different countries adds to the broader understanding of the condition's management. Comparative studies across different populations can highlight variations in disease presentation, response to interventions, and healthcare utilization. Insights from the Jordanian study can contribute to the global knowledge base on COPD management.

Materials and Methods

Study design and setting

This study used a quasi-experimental design with the pre-post-test method to assess the impact of a respiratory care bundle on managing symptoms in COPD patients in Jordan.

The study was conducted in six hospitals located in the capital city of Jordan, Amman. These selected hospitals were randomly chosen from a list of large hospitals, ensuring that each hospital had a capacity of at least 200 beds and was equipped to provide comprehensive medical and surgical care. The chosen hospitals encompassed a diverse range of healthcare settings, including two private hospitals, two governmental hospitals, one educational institution-affiliated hospital, and one military hospital. This selection aimed to capture the four distinct sectors of the healthcare system in Jordan, including private, governmental, educational, and military. Such a comprehensive approach was taken to guarantee a representative reflection of the varied healthcare landscape in Jordan, potentially influencing the study's findings.

Study participants and sampling

The study employed a convenience sampling technique to recruit 120 participants. The sample was split into control and intervention groups. The control group received a health education program with a discharge plan, providing concise instructions on COPD medications and preventive measures. Meanwhile, the intervention group, in addition to the health education program, received training on respiratory care bundles. This training encompassed guidance on using deep breathing exercises, incentive spirometry, and airway clearance techniques. These respiratory care bundles were intended for home use post-discharge.

Patients were included if they were diagnosed with COPD or bronchial asthma, aged more than 18 years, could read and write in Arabic, and had a discharge plan within 3 days of data collection. Patients with chronic renal failure, cancer, or any instance of data collection affected by medical instability were excluded. Medical instability in this context refers to situations where data collection could be compromised due to factors such as acute medical conditions, treatment interventions, or procedures that might impact the accuracy and reliability of the collected information. Additionally, participants who were hospitalized during the study period were excluded from the final data analysis to prevent potential confounding factors that could arise from their hospitalization status. This approach ensures the integrity of the data and the validity of the study's findings.

The determination of the sample size for this study was conducted using G-power software. Statistical power tests were employed with an alpha level (*P* value) of .05, a medium effect size of 0.30, and a power of 0.80 to ascertain an appropriate sample size. The applied statistical analyses encompassed paired *t*-tests and ANCOVA tests. Initially, a minimum sample size of 92 participants, divided into 46 participants per group, was calculated. In anticipation of potential dropouts during the follow-up phase, an additional 28 participants were recruited, resulting in a total of 120 participants enrolled at the baseline. Individuals eligible for the study but opting not to participate in the intervention group and the associated respiratory care bundles were invited to join the control group and contribute to the study's completion.

Ethical consideration

This study was approved by the institutional review board of the Scientific Research Committee at Applied Private University in Amman, Jordan (Approval no. 2021-2022-8-82). Permission was also obtained from the selected hospitals to recruit study participants.

Before participation, all eligible participants were asked to sign an informed consent form indicating their agreement to participate in the study. Participants were told their participation was voluntary and had the right to withdraw without penalty. Additionally, they were assured that any information obtained during the study would be kept confidential and their personal information would be kept anonymous if used for publication. The data collected were stored on a password-protected computer with access granted only to the research team.

Data collection tool and technique
Data collection procedures were carried out by three research authors with PhD in critical care nursing. After obtaining ethical approval and signed informed consent, the authors collected data at baseline and follow-up using a self-administered questionnaire distributed between May 2022 and December 2022. The head nurses of departments in the selected settings were consulted to obtain potential eligible participants' names and contact information. The authors approached patients who fulfilled the inclusion criteria and provided them with a comprehensive explanation of the study. Specifically, individuals meeting the inclusion criteria were invited to participate, while those meeting any of the exclusion criteria were not included in the study. The inclusion and exclusion criteria were verified by reviewing patients' medical records and consulting with the assigned nurse.

Before the educational session and intervention training on the respiratory care bundle, a committee of three external evaluators was formed, which included a clinical nurse specialist with a doctorate in critical care and two pulmonologists with extensive clinical experience. This committee verified the health education program, discharge plan, and guidance training program on respiratory care bundles planned to be provided to the participants in this study, using textbooks and respiratory care manuals.[23-25] In addition, a pilot study was conducted with 10 eligible participants, and the external evaluators observed the authors during the education, training, and data collection processes to ensure consistency and inter-rater reliability among the authors.

The sample was partitioned into control and intervention groups. Initial baseline data collection encompassed participants' sociodemographic and clinical characteristics, along with the St. George's Respiratory Questionnaire for COPD patients (SGRQ-C questionnaire).[26] Following this baseline data collection through the structured questionnaires, the control group received a health education program, including a discharge plan with succinct instructions on COPD medications and preventive measures, administered in their hospital rooms before discharge from the selected settings. This health education program lasted between 25 and 40 minutes. Simultaneously, the intervention group, alongside the health education program, received training on respiratory care bundles, which involved guidance and training on using deep breathing exercises, incentive spirometry, and airway clearance techniques. The training on respiratory care bundles spanned 30 to 40 minutes. Subsequently, the implementation of these respiratory care bundles was intended for home use after discharge.

Participants in the intervention group were instructed to perform the respiratory care bundle interventions between 30 and 45 minutes daily and recommended twice daily (morning and evening) for at least 20 minutes each time, at their home after discharge from the hospital. However, participants who did not practice these interventions for at least 30 minutes at least 4 days per week were excluded from the final data analysis during the follow-up data collection (post-test).

Furthermore, twice weekly, follow-up phone calls were made to the intervention group to monitor their adherence to practicing the respiratory care bundles and address any inquiries they might have. After a 4-week period following participants' discharge from the hospitals, both the control and intervention groups were requested to complete the SGRQ-C questionnaire as a post-test. This post-test aimed to analyze the participants' data before and after the interventions (preinterventions and post-interventions), allowing for a comparative assessment and evaluation of the effectiveness of the provided interventions within each group.

Measurement of variables
The measurement of variables in this study used a structured self-reported questionnaire consisting of two parts. The first part was a demographic and clinical characteristics sheet which included information about the patient's age, gender, marital status, education level, employment status, and history of chronic diseases such as hypertension and diabetes mellitus. The second part was the Arabic version of the SGRQ-C questionnaire.[27,28] The SGRQ was specifically designed to measure the impact of chest disease on patients' health-related QoL and wellbeing and has since been extensively validated in numerous studies.[27,29,30]

The SGRQ consists of a series of questions assessing the impact of respiratory symptoms on three domains of health-related QoL: symptoms, activity, and impacts. The symptoms domain includes questions about the frequency and severity of respiratory symptoms, such as coughing and shortness of breath. The activity domain assesses the impact of respiratory symptoms on the patient's ability to perform daily activities, such as walking, climbing stairs, and carrying out household tasks. The impacts domain includes questions about the social, psychological, and emotional impact of respiratory symptoms on patients' lives, such as feelings of anxiety, depression, and social isolation. A total score was calculated with all weighted items and expressed as a percentage, where 100 represents the worst possible health status and 0 represents the best possible health status.[26,30]

The questionnaire is reliable and valid for measuring health-related QoL in COPD patients, with good

internal consistency, test-retest reliability, and construct validity.[26,29,30] The Arabic version of the SGRQ-C questionnaire is translated and validated.[27] The Arabic version is a reliable and valid instrument for assessing health-related QoL in COPD patients, with high internal consistency and construct validity.[27,28]

Data analysis

In this study, data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize the participants' demographic and clinical characteristics and the SGRQ-C scores. Independent *t*-tests or Chi-square analyses were conducted to examine any significant differences between the intervention and control groups' baseline characteristics, health status, ABGs, and vital signs. A paired *t*-test was used to compare the pre-intervention and post-intervention scores of the SGRQ-C subscales and total scores for both the intervention and controlled groups. Additionally, a one-way pretest and post-test ANCOVA analysis were conducted to investigate further the effectiveness of the respiratory care bundle intervention on improving health-related outcomes, controlling for the pretest as a covariance. This analysis was used to compare the intervention and control groups' scores on the SGRQ-C components and total scores post-intervention and to determine whether the intervention significantly improved participants' QoL. All statistical tests were two-tailed, and a *P* value of less than .05 was considered statistically significant.

Results

The study began by interviewing 152 eligible participants, all of whom were invited to take part. Of those, 120 agreed to participate and completed the questionnaire. This included 66 participants in the control group and 54 in the intervention group. Of the 120 participants who completed the questionnaire, 105 followed the recommended interventions of respiratory bundles and also completed the questionnaire. The sample selection and completion chart are presented in Figure 1.

The study found no significant differences between patients' characteristics, health status and characteristics, forced expiratory volume (FEV 1), and respiratory and heart rates between the controlled and intervention groups at baseline. The majority of the participants were men (55.8%), married (79.2%), Jordanians (76.7%), employed (71.7%), current smokers (65.8%), reported their health as good status, and had completed high school (52.5%). Nearly half of the participants had diabetes mellitus (49.2%). On average, participants were aged 55.11 years, overweight with a body mass index of 25.61, and slept approximately 6.52 hours per day in the 2 weeks before hospital admission [Table 1].

A paired *t*-test for both the intervention and control groups was used to compare the pre-intervention and post-intervention means of the outcome variables (the SGRQ-C subscales). The results showed that the intervention group had significant reductions in SGRQ-C symptoms components (t = 7.62, *P* < .001), activity component (t = 7.58, *P* < .001), impact component (t = 7.56, *P* < .001), and total scores of SGRQ-C post-intervention (t = 7.52, *P* < .001). In contrast, the controlled group did not have significant reductions in all SGRQ-C components and total scores post-intervention. The significant reductions in SGRQ-C scores for the intervention group indicate that the intervention positively affected their QoL. The lack of significant reductions for the controlled group suggests that any changes in their SGRQ-C scores were likely due to factors other than the intervention [Table 2].

Moreover, a one-way pretest and post-test ANCOVA analysis were conducted to investigate the effectiveness of interventional programs in improving health-related outcomes for COPD patients. The results [Table 3] showed significant differences in scores of all SGRQ-C components and total scores of SGRQ-C post-intervention between the two groups, indicating that the intervention had a positive effect on participants' QoL (f = 11.35, *P* < .001), with 41% of improvement of their overall QoL (η^2 = 0.41). Specifically, the intervention led to a reduction in COPD symptoms (f = 5.82, *P* < .001), an improvement in participants' activities (f = 8.31, *P* < .001), and a reduction in the impact of COPD on their daily life and health status (f = 7.24, *P* < .001). The study's findings suggest that providing additional respiratory care bundle training for COPD patients can significantly improve their QoL, as measured by the SGRQ scores.

Discussion

COPD is a chronic respiratory disease characterized by airflow limitation that progresses over time, leading to significant morbidity and mortality. The literature review highlights that pharmacological therapies and pulmonary rehabilitation programs are traditional methods to manage COPD symptoms, but they may not be feasible for all patients.[3] Therefore, alternative strategies and personalized self-management programs that may be safer, more effective, and feasible for all COPD patients are needed to improve dyspnea and QoL. The review also emphasizes the importance of targeting barriers to self-care, such as poor inhaler technique and limited understanding of medicines, through a personalized self-management program.[2,3,7,11] However, respiratory care bundles, including practicing
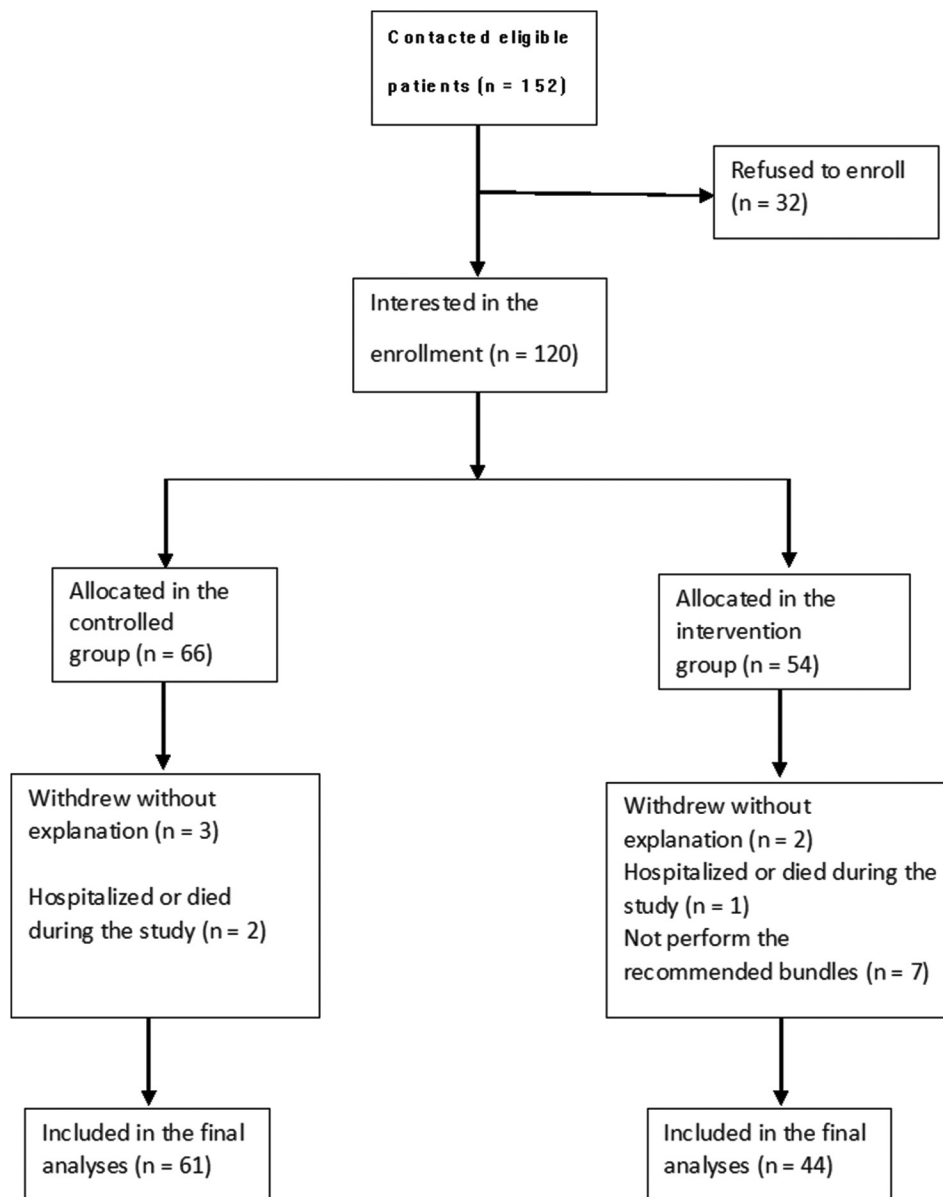
Figure 1: Participants' selection, enrollment and completion chart

deep breathing exercises, incentive spirometry, airway clearance techniques, and engaging in pulmonary rehabilitation programs, including supervised exercise training and self-management education, have been noted to reduce readmission rates to hospitals and improve QoL in COPD patients.[11,13,14,17,20]

Conducting a study to fill the gap in knowledge and literature about a particular topic in Arab countries, especially Jordan, is of utmost importance. So, this research can provide valuable insights and clinical guidance to healthcare professionals, policymakers, and regional researchers. This study can significantly improve healthcare delivery in Arab countries, particularly Jordan, and pave the way for evidence-based interventions and policies.

The present study's results indicate that the controlled and intervention groups had similar characteristics and health status. This is a positive outcome because it implies that any discrepancies in the results between the groups can be attributed to the respiratory care bundle intervention rather than dissimilarities in the patients themselves. This information is valuable because it places the study's findings in context and ensures that the results apply to comparable populations. The results of this study are consistent with previous research that has shown that patients with COPD have similar baseline characteristics and health status.[12,21] Another study found that COPD patients in the control and intervention groups had similar levels of dyspnea, exercise capacity, and QoL at baseline.[11] These findings suggest that patient characteristics and health status

Table 1: Baseline characteristics of control and intervention groups (*n*=120)

Characteristics	Total^ (*n*=120)	Controlled group^ (*n*=66)	Intervention group^ (*n*=54)	*P**
Age (years)	55.11 (±8.12)	55.23 (±8. 67)	54.80 (±7.73)	0.881
Gender				
Men	67 (55.8%)	37 (56.0%)	30 (55.6%)	0.353
Women	53 (44.2%)	29 (44.0%)	24 (44.4%)	
Marital status				
Married	95 (79.2%)	53 (80.3%)	42 (77.8%)	0.892
Single/Divorced/Widowed	25 (20.8%)	13 (19.7%)	12 (12.2%)	
Nationality				
Jordanian	92 (76.7%)	50 (75.8%)	42 (77.8%)	0.590
Syrian	28 (23.3%)	16 (14.2%)	12 (12.2%)	
Level of education				
< High school grade	57 (47.5%)	32 (48.5%)	25 (46.3%)	0.863
≥ High school grade	63 (52.5%)	34 (51.5%)	29 (54.7%)	
Employment status				
Yes	86 (71.7%)	48 (72.7%)	38 (70.3%)	0.898
No	34 (28.3%)	18 (27.3%)	15 (29.7%)	
Smoking status				
Yes	79 (65.8%)	43 (65.2%)	36 (66.7%)	0.792
No	41 (34.2%)	23 (34.8%)	18 (33.3%)	
Perceived current health status				
Excellent/Very good	45 (37.5%)	24 (36.4%)	21 (38.9%)	
Good	51 (42.5%)	29 (43.9%)	22 (40.7%)	0.814
Fair/Poor	24 (20.0%)	13 (19.6%)	11 (20.3%)	
Body mass index (Kg/m^2)	25.61 (±4.23)	26.32 (±4.82)	24.71 (±3.72)	0.623
Duration of sleep (hours/day) (prior 2 weeks of admission to hospital)	6.52 (±1.25)	6.24 (±0.91)	6.82 (±1.43)	0.414
Chronic illnesses				
Hypertension	50 (41.7%)	27 (40.9%)	23 (42.6%)	0.751
Diabetes mellitus	59 (49.2%)	21 (31.8%)	18 (33.3%)	
Others*	31 (25.8%)	18 (27.3%)	13 (24.1%)	
Forced Expiratory Volume (FEV 1)	57.3 (±17.24)	55.7 (±18.62)	59.2 (±15.66)	0.294
Arterial blood gases results				
Ph	7.29 (±1.22)	7.28 (±1.14)	7.30 (±1.23)	0.093
O$_2$ Saturation (%)	72.8 (±5.22)	72.4 (±5.63)	73.2 (±4.93)	0.082
PaO$_2$ (mm Hg)	72.3 (±7.63)	71.9 (±7.11)	72.5 (±8.81)	0.180
PaCO$_2$ (mm Hg)	61.7 (±11.71)	63.4(±11.23)	60.6 (±12.45)	0.213
HCO$_3$ (mmol/L)	30.5 (±8.23)	31.8 (±5.04)	29.9 (±5.42)	0.305
Heart rate	91.2 (±8.26)	94.4 (±9.32)	87.2 (±7.57)	0.063
Respiratory rate	26.5 (±2.94)	28.1 (±3.24)	23.6 (±2.65)	0.064

^Statistical analysis is: mean (±SD) or frequency [*n* (%)]. *Statistical analysis is: independent *t*-test or Chi-square analysis (χ^2). SD: Standard deviation

do not play a significant role in the effectiveness of respiratory care interventions. Therefore, the results of this study have important implications for clinical practice and future research in this region, as they suggest that respiratory care bundle interventions can be effective regardless of patients' baseline characteristics and health status.

The study aimed to investigate the effectiveness of respiratory care bundle intervention on COPD patients' QoL. The results showed no significant differences in the mean scores of symptoms, activity, and impact components before the intervention and the total score for both groups. However, after the intervention, there were statistically significant differences in all SGRQ-C

subscales means, which were lower in the intervention group than in the control group, indicating the positive effect of the intervention on their QoL.

The study also compared the intervention and control groups, with the intervention group receiving additional respiratory care bundle training and the control group receiving only an education program. The results showed significant differences in all SGRQ-C components and total scores post-intervention between the two groups, indicating that the intervention positively affected participants' QoL. Specifically, the intervention led to a reduction in COPD symptoms, an improvement in participants' activities, and a reduction in the impact of COPD on their daily life and health status. These

Table 2: Comparison of pre-intervention and post-intervention measurements between the intervention and controlled groups

Outcome	Pre-intervention (Mean±SD)	Post-intervention (Mean±SD)	*t*-test	*P**
Intervention group				
Symptoms component	62.68 (12.45)	42.68 (12.45)	7.62	**<0.001**
Activity component	63.32 (21.90)	43.32 (21.90)	7.58	**<0.001**
Impact component	63.48 (16.94)	43.48 (16.94)	7.56	**<0.001**
Total score of 3 components	66.85 (15.99)	46.85 (15.99)	7.52	**<0.001**
Controlled Group				
Symptoms component	69.33 (13.41)	68.96 (15.55)	0.58	0.452
Activity component	60.33 (18.11)	59.06 (16.87)	0.61	0.271
Impact component	66.06 (16.36)	55.71 (18.36)	1.34	0.079
Total score of 3 components	67.50 (15.02)	59.06 (14.62)	11.12	0.058

*Statistically significant value is bolded. SD: Standard deviation

Table 3: The effectiveness of interventional programs on improving COPD patients' health-related outcomes for the intervention and controlled groups

Outcomes	f	*P**	$\eta^{2\wedge}$
Symptoms component	5.82	**<0.001**	0.23
Activity component	8.31	**<0.001**	0.36
Impact component	7.24	**<0.001**	0.29
Total score of 3 components	11.35	**<0.001**	0.41

*Statistically significant value is bolded. $^{\wedge}\eta^2$: partial eta squared

findings are consistent with previous studies showing the effectiveness of respiratory care bundle intervention in improving COPD patients' QoL. The study's results have important implications for clinical practice and future research, as they suggest that respiratory care bundle interventions can effectively improve COPD patients' QoL.

Moreover, the study's results indicated that using a respiratory bundle care intervention effectively improved health-related QoL scores among patients diagnosed with COPD. This finding is consistent with previous studies highlighting the effectiveness of pulmonary rehabilitation programs, incentive spirometry, and deep breathing exercises in improving lung function and reducing dyspnea symptoms in COPD patients. For instance, previous studies have demonstrated the effectiveness of incentive spirometry in improving respiratory function, Arterial blood gases test (ABGs) results, and health-related QoL.[11] Similarly, recent studies have highlighted the effectiveness of deep breathing exercises in reducing dyspnea symptoms and improving ventilation and QoL in COPD patients.[12,14,16,31] The present study's findings were also supported by previous studies, which indicated that the respiratory care bundle effectively reduces dyspnea among bronchial asthma patients.[8,11,16,17,20] Therefore, these studies suggest that nonpharmacological interventions such as respiratory bundle care, incentive spirometry, and deep breathing exercises can improve respiratory function and QoL among COPD and bronchial asthma patients.

Limitation and recommendations

COPD is a widespread respiratory condition affecting millions worldwide, resulting in reduced QoL and increased healthcare utilization. Despite the availability of effective interventions, such as respiratory care bundles, many healthcare providers fail to educate patients and provide adequate training on their use.[19-22] This study proposes several recommendations and implications for healthcare providers to improve COPD patient outcomes and reduce healthcare costs.

First, healthcare providers should receive training and education on respiratory care bundles to effectively educate their COPD patients on the importance of these interventions. Patients should also be encouraged to practice respiratory care bundles to improve their QoL and reduce healthcare utilization. Training and educational materials, such as online resources, workshops, and conferences, should be available to encourage healthcare providers to provide this education. Healthcare providers should also be incentivized to provide high-quality care through financial incentives or recognition. Furthermore, it is recommended to conduct randomized controlled trials to evaluate the effectiveness of an educational intervention for healthcare providers on respiratory bundle care implementation and patient outcomes. Investigating the long-term effects of implementing respiratory bundle care on patient outcomes and healthcare costs and exploring the potential role of telehealth in delivering respiratory bundle care and its impact on patient outcomes are also important research areas. Additionally, it is essential to investigate the acceptability and effectiveness of implementing respiratory bundle care in different healthcare settings and patient populations.[3,10,22]

Furthermore, implementing respiratory bundle care requires a multidisciplinary approach and collaboration between healthcare providers and patients. Patients should be empowered to practice respiratory care

bundles and play an active role in managing their COPD. Healthcare organizations should prioritize implementing respiratory bundle care and provide resources for training and education to improve patient outcomes and reduce healthcare costs.[2,7,32]

Conducting qualitative studies to explore the barriers and facilitators to implementing respiratory bundle care in clinical practice from the perspective of healthcare providers and COPD patients can help identify challenges and opportunities for improving respiratory bundle care implementation.

Conclusion

This study provides several recommendations and implications for healthcare providers to improve COPD patient outcomes and reduce healthcare costs by implementing respiratory care bundles. Healthcare providers should receive training and education on respiratory care bundles to effectively educate their COPD patients on the importance of these interventions. Patients should also be encouraged to practice respiratory care bundles to improve their QoL and reduce healthcare utilization. Implementing respiratory bundle care requires a multidisciplinary approach and collaboration between healthcare providers and patients, and healthcare organizations should prioritize the implementation of respiratory bundle care and provide resources for training and education to improve patient outcomes and reduce healthcare costs.

Authors declaration statement
The authors declare that they have no conflicts of interest or competing interests.

Conflicts of interest
There are no conflicts of interest.

References

1. Mintz M, Barjaktarevic I, Mahler DA, Make B, Skolnik N, Yawn B, *et al*. Reducing the risk of mortality in chronic obstructive pulmonary disease with pharmacotherapy: A narrative review. Mayo Clin Proc 2023;98:301-15. doi: 10.1016/j.mayocp.2022.09.007.

2. Gomes F, Cheng SL. Pathophysiology, therapeutic targets, and future therapeutic alternatives in COPD: Focus on the Importance of the Cholinergic System. Biomolecules 2023;13:476. doi: 10.3390/biom13030476.

3. Aggarwal AN. The 2022 update of the global initiative for chronic obstructive lung disease guidelines for chronic obstructive pulmonary disease: Implications for primary health care. IJNCD 2022;7:53. https://doi.org/10.4103/jncd.jncd_39_22.

4. Budhiraja R, Siddiqi TA, Quan SF. Sleep disorders in chronic obstructive pulmonary disease: Etiology, impact, and management. J Clin Sleep Med 2015;11:259-70. doi: 10.5664/jcsm.4540.

5. Dhamane AD, Witt EA, Su J. Associations between COPD severity and work productivity, health-related quality of life, and health care resource use: A cross-sectional analysis of national survey data. J Occup Environ Med 2016;58:e191-7. doi: 10.1097/JOM.0000000000000735.

6. John P, Macaden L, Christopher. Quality of life in patients with bronchial asthma in a tertiary care setting in south India. IJNH 2017;3:420-7.

7. Janssens W, Verleden GM. Nonpharmacological interventions in COPD. Eur Respir Rev 2023;32:230028. doi: 10.1183/16000617.0028-2023.

8. Portillo EC, Lehmann MR, Hagen TL, Costner MG, Kettner JT, Bhardwaj SD, *et al*. Integration of the patient-centered medical home to deliver a care bundle for chronic obstructive pulmonary disease management. JAPhA 2023;63:212-9. https://doi.org/10.1016/j.japh.2022.10.003.

9. Kendra ME, Kakwani A, Uppala A, Mansukhani R, Pigott DK, Soubra M, *et al*. Impact of a COPD care bundle on hospital readmission rates. J Am Pharm Assoc (2003) 2023;63:269-74. doi: 10.1016/j.japh. 2022.10.002.

10. Morton K, MacNeill S, Sanderson E, Dixon P, King A, Jenkins S, *et al*. Evaluation of 'care bundles' for patients with chronic obstructive pulmonary disease (COPD): A multisite study in the UK. BMJ Open Respir Res 2019;6:e000425. doi: 10.1136/bmjresp-2019-000425.

11. Thankachan A. "A Quasi experimental study to evaluate the effectiveness of respiratory care bundle on dyspnea among patients with bronchial asthma at selected hospitals, Pudukkottai," Karpaga Vinayaga College of Nursing, Pudukkottai; 2018. Available: http://repository-tnmgrmu.ac.in/id/eprint/11597.

12. Karthika K. "A Quasi experimental study to evaluate the effectiveness of deep breathing exercise among patients with chronic obstructive pulmonary disease who are aged between 50-60 years in selected hospitals at Dindigul District," Sakthi College of Nursing, Dindigul; 2017. Available: http://repository-tnmgrmu.ac.in/id/eprint/6913.

13. Lu Y, Li P, Li N, Wang Z, Li J, Liu X, *et al*. Effects of Home-Based Breathing Exercises in Subjects With COPD. Respir Care 2020;65:377-87. doi: 10.4187/respcare.07121.

14. Paiva DN, Assmann LB, Bordin DF, Gass R, Jost RT, Bernardo-Filho M, *et al*. Inspiratory muscle training with threshold or incentive spirometry: Which is the most effective?. Rev Port Pneumol (2006) 2015;21:76-81. doi: 10.1016/j.rppnen. 2014.05.005.

15. El-Koa AA, Eid HA, Abd Elrahman SR, and El Kalashy MM. Value of incentive spirometry in routine management of COPD patients and its effect on diaphragmatic function. The Egyptian Journal of Bronchology 2023;17:8. https://doi.org/10.1186/s43168-023-00185-7.

16. Westerdahl E, Osadnik C, Emtner M. Airway clearance techniques for patients with acute exacerbations of chronic obstructive pulmonary disease: Physical therapy practice in Sweden. Chron Respir Dis 2019;16:1479973119855868. doi: 10.1177/1479973119855868.

17. Osadnik CR, McDonald CF, Jones AP, Holland AE. Airway clearance techniques for chronic obstructive pulmonary

disease. Cochrane Database Syst Rev 2012;14:CD008328. doi: 10.1002/14651858.CD008328.pub2.

18. Osen SM. Respiratory therapists' roles in reducing 30-day readmission rates for patients with COPD. Walden University; 2020. Available from: https://scholarworks.waldenu.edu/dissertations/8415.

19. M Burnett D, R Sharpe M. Identifying the role of the respiratory therapist on the multidisciplinary team in the intensive care recovery clinic. Respir Care 2021;66:1929-31.

20. Zafar MA, Nguyen B, Gentene A, Ko J, Otten L, Panos RJ, *et al*. Pragmatic challenge of sustainability: Long-Term adherence to COPD care bundle maintains lower readmission rate. Jt Comm J Qual Patient Saf 2019;45:639-45. doi: 10.1016/j.jcjq.2019.05.011.

21. Milner SC, Boruff JT, Beaurepaire C, Ahmed S, Janaudis-Ferreira T. Rate of, and barriers and enablers to, pulmonary rehabilitation referral in COPD: A systematic scoping review. Respir Med 2018;137:103-14. doi: 10.1016/j.rmed.2018.02.021.

22. Ike, I. C. Respiratory Therapists' Perceptions of Their Roles in a COPD Multidisciplinary Care Team (Doctoral dissertation, Walden University), (2023). Available: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Ike+IC.+Respiratory+therapists%E2%80%99+perceptions+of+their+roles+in+a+COPD+multidisciplinary+care+team%2C%22+Walden+University%2C+&btnG=.

23. Clini E, Holland AE, Pitta F, Troosters T, Textbook of pulmonary rehabilitation: Springer; 2018.

24. Landsberg J. Manual for pulmonary and critical care medicine e-book: Elsevier health sciences; 2017.

25. Hinkle JL, Cheever KH. Brunner and Suddarth's textbook of medical-surgical nursing: Wolters Kluwer India Pvt Ltd; 2018.

26. Jones P. St George's respiratory questionnaire for COPD patients (SGRQ-C); 2008. Available from: https://www.thoracic.org/members/assemblies/assemblies/srn/questionaires/sgrq.php.

27. Akiki Z, Hallit S, Layoun N, Cherfane M, Sacre H, Waked M, *et al*. Validation of the St George's respiratory questionnaire and risks factors affecting the quality of life of Lebanese COPD and asthma patients. J Asthma 2019;56:1212-21. doi: 10.1080/02770903.2018.1531996.

28. Zamzam MA, Azab NY, El Wahsh RA, Ragab AZ, Allam ME. Quality of life in COPD patients. Egyptian journal of chest diseases and tuberculosis 2012;61:281-9. https://doi.org/10.1016/j.ejcdt.2012.07.002.

29. Gupta N, Pinto LM, Morogan A, Bourbeau J. The COPD assessment test: A systematic review. Eur Respir J 2014;44:873-84. doi: 10.1183/09031936.00025214.

30. Paap MC, Brouwer D, Glas CA, Monninkhof EM, Forstreuter B, Pieterse ME, *et al*. The St George's Respiratory Questionnaire revisited: A psychometric evaluation. Qual Life Res 2015;24:67-79. doi: 10.1007/s11136-013-0570-y.

31. Mendes Xavier D, Lanza Galvão E, Aliane Fonseca A, de Souza GM, Pereira Lima V. Effects of home-based pulmonary rehabilitation on dyspnea, exercise capacity, quality of life and impact of the disease in COPD patients: A systematic review. COPD 2022;19:18-46. doi: 10.1080/15412555.2021.2020234.

32. Liu W, Liu Y, Li X. Impact of exercise capacity upon respiratory functions, perception of dyspnea, and quality of life in patients with chronic obstructive pulmonary disease. Int J Chron Obstruct Pulmon Dis 2021;16:1529-34. doi: 10.2147/COPD.S311221.