- *Basic Research*

Effect of Self learning Module on Health-related Behavior and Application of Therapeutic Regimen among Interstitial Lung Disease Patients

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Abstract:

Background: Interstitial Lung Disease (ILD) refers to a group of lung disorders characterized by inflammation and scarring. The lung's interstitial tissue supports the air sacs. This damage leads to progressive lung stiffness, reducing the lungs' ability to expand fully and impairing oxygen exchange. The disease significantly impacts patients' functional abilities and quality of life, often leading to increased morbidity and mortality. Early diagnosis, proper medical management, pulmonary rehabilitation, and patient education play essential roles in slowing disease progression, improving clinical outcomes, and enhancing quality of life for individuals living with ILD. **Aim of the Study:** to evaluate the effect of the self-learning module on health behaviors and application of therapeutic regimen for interstitial lung disease patients. **Research Design:** A quasi-experimental design was adopted for the research study.**Setting:** The present study was conducted at the inpatient department at Damnahour Chest Hospital. **Subject**: A convenience sample of 80 interstitial lung disease adult patients were recruited in the current study, they were randomly assigned into two equal study and control groups **Tools**: Three tools were used, tool I " Demographic and respiratory assessment ", tool II: " Interstitial lung disease health related behaviors assessment " It was a structured self-reported interview schedule and tool III: " Observational checklist of application of therapeutic regimen of ILD patients " it was used to assess the steps of using of inhaler, performance of pursed lips breathing exercise and coughing exercise. **Results**: The study revealed a significant improvement in health-related behaviors and the application of the therapeutic regimen among the study group compared to the control group after the implementation of the self-learning module (SLM). The study group also exhibited higher satisfaction levels, with a strong positive correlation between improved health behaviors and practice adherence ($r = 0.528$, $p < .001$), whereas no significant variation was shown in the control group. **Conclusion**: Based on the findings of the present study, it is notable that the majority of patients in the study group showed a statistically significant improvement in total mean scores of health behaviors and application of the therapeutic regimen compared with the control group after two and four weeks of implementation of the SLM. **Recommendation:** A self-learning module is designed systematically and continuously for patients with ILD. In hospitals, it is supplemented by various media, including WhatsApp groups, television, and other channels, to enhance the health status of these patients.

Keywords: Health-related behavior, Interstitial lung disease, Nursing intervention, Patient, Self-learning module, Therapeutic regimen.

1. Introduction

Interstitial lung disease (ILD) is a heterogeneous group of chronic lung diseases that encompasses more than 200 pulmonary disorders. A large number of patients with ILD develop a progressive fibrosing phenotype along the course of the disease that is associated with worsening respiratory symptoms, decreased lung function, resistance to treatment, and, then, early mortality **(Flaherty et al, 2017)**. Interstitial lung disease, also known as diffuse parenchymal lung disease, is an umbrella term for a group of chronic lung diseases that affect the interstitial space of the lungs, where tissues between the air sacs are damaged by inflammation or fibrosis. Due to this inflammation, the interstitium becomes thickened, resulting in a decreased passage of oxygen into the blood and, consequently, difficulty in breathing **(Hagler et al., 2022).**

The common causes of ILDs are unknown; however, known causes include the inhalation of occupational and environmental toxins. Certain drugs, radiation therapy, connective tissue disorders, respiratory infections, and cancer could be other possible causes of ILD. Patients with ILD usually complain of dyspnea, nagging cough, fatigue, limitation of routine activities, and impaired physical and emotional well-being, which eventually causes poor quality of life (QoL). Because lung scarring is irreversible, treatment of ILD aims to decrease exposure to risk factors and control the disease process. Patients with ILD usually require symptomatic management, mainly with oxygen supplementation and pharmacotherapy of opiate-based agents **(Khor et al, 2019)**. Corticosteroids, anti-fibrotic agents, and immunosuppressant drugs can minimize disease progression, and low-dose narcotics may be needed sometimes. Lung transplantation may be a treatment of choice for some patients in advanced cases **(Hagler et al., 2022)**.

The cornerstone of treating patients with ILD is proper early diagnosis to initiate a specific, comprehensive management plan to achieve remission and control of the disease process before complications occur. Pulmonary rehabilitation should be used alongside pharmacological therapy. Pulmonary rehabilitation, including pursed-lip breathing and 6-minute walk distance, is another vital component of ILD treatment. Along with patient education, these treatments play a crucial role in symptom management, thereby decreasing the disease burden on patients, healthcare institutions, and the broader community **(Dowman et al., 2022).**

Interstitial lung disease commonly affects patients between the ages of 45 and 72 years. In these patients, morbidity rate increases with age, thus usually causing impaired health-related quality of life and disease outcomes. On the other hand, the burden of disease management will increase, possibly related to the fact that around half of these patients take five or more costly medicines, which may lead to side effects and drug interactions. Consequently, it may lead to drug non-adherence as well as poor commitment to the proper application of the prescribed therapeutic regimen. Hence, these factors may lead to a significant increase in various healthcare utilization and community burden. **(Khor et al, 2019)**. To maximize the efficiency of treatment measures, adherence to the correct application of the prescribed therapeutic regimen is vital for ILD patients. Adherence to treatment measures can be encouraged through patient and family education and follow-up, thereby maximizing the effectiveness of the treatment.

Health education is a crucial step in managing these patients, as a better understanding of the disease process, risk factors, and treatment plan consequently improves patients' progress. Gaining the required knowledge and skills regarding the management of ILD is primarily the

responsibility of healthcare providers, mainly nursing staff, who either directly interact with patients and/or caregivers who provide support in coping with the disease process and lifestyle modifications **(Garibaldi, 2016).** One of the patient's education methods is the self-learning module (SLM).

Currently, self-directed learning education has become a universal trend, especially with the advancement of technology and open internet access. It can be used with ILD patients and caregivers under the guidance and supervision of healthcare providers, primarily nursing staff, as part of their health education programs. The self-learning module is a self-instructed, self-explanatory, self-directed, and self-evaluation method for evaluating the effectiveness of an educational program on patients. This module was designed to help patients and caregivers acquire the necessary knowledge, skills, and attitudes related to specific aspects of their disease. On the other hand, both patients and caregivers can benefit from the self-learning module in overcoming various barriers, such as the cost and distance of health services. It can also be used at home by patients and caregivers, provided that skilled healthcare providers maintain continuous monitoring and supervision. Finally, it can improve patients' independence by providing them with a self-management model that motivates adherence and encourages them to act independently, bit by bit **(Salah Eldin & Abdelwahab, 2019).**

2. Significance of the study:

With the lifelong duration of ILD, the nursing role is expanding to include direct nursing care, patient and caregiver education, and follow-up. At the same time, it increases the burden on nurses, especially with the current shortage of nursing staff in Damnahour Chest Hospital, El-Beheria governorate, Egypt. Hence, utilizing self-learning modules to enhance adherence among patients and caregivers to ILD therapeutic regimens is beneficial for patients, caregivers, nursing staff, healthcare institutions, and the broader community. Whereas this module has been used in other areas of nursing research in Egypt with significant effect, such as in nurses caring for patients undergoing upper gastrointestinal Endoscopy **(Salah Eldin & Abdelwahab, 2019)**. This model also had a considerable impact on self-efficacy and adherence to the therapeutic regimen for patients with bronchial asthma **(Hussein et al., 2020).** Therefore, a self-learning module is used in this study to evaluate its effect on the health behaviors and proper application of the therapeutic regimen among patients with interstitial lung disease.

3. Aim of the Study:

This study aimed to evaluate the effect of a self-learning module on health behaviors and the application of a therapeutic regimen for patients with interstitial lung disease.

4. Research hypothesis:

H0: Interstitial lung disease patients who will undergo the self-learning module will have the same health-related behavior and application of therapeutic regimen as those who will not.

H1: Interstitial lung disease patients who will undergo the self-learning module will exhibit better health-related behavior than those who will not.

H2: Interstitial lung disease patients who will undergo the self-learning module will exhibit better application of the therapeutic regimen than those who will not.

5. Subject and Methods:

5.1 Study Design and Setting:

A quasi-experimental research design of (pre- and post-test control group) was used. The present study was conducted at the inpatient department and the outpatient clinic of Damnahour Chest Hospital, affiliated with the Ministry of Health and Population, El-Boheria Governorate, Egypt. The inpatient department (pulmonary unit) is located on the third floor and is composed of 6 rooms (3 for male and 3 for female patients) with a capacity of 60 beds (five beds in each room).

5.2 Subjects

- A convenience sample of 80 adult patients with interstitial lung diseases was selected according to certain criteria; All patients having stable ILD (no exacerbations 4weeks before starting SLM and under regular conventional therapy) were included. Acute exacerbation of ILD was defined as a rapid worsening of respiratory symptoms with increased dyspnea within less than 1 month. Free of history of syncope on exertion or any comorbidities that counteract SLM, for example, severe orthopedic or neurological deficits, unstable cardiac disease, severe pulmonary hypertension, mental illness, and patients with interstitial pneumonia who required ventilator support.
- Based on the estimated sample size calculated using the Epi Info 7 program, a sample size of participants from the settings mentioned above was recruited for the current study. Using the following parameters:

    1. The total population size is estimated to be 100 over 12 months.
    2. Expected frequency: 50%
    3. Acceptable error: 5%
    4. Confidence coefficient: 95%
    5. Minimum sample size: 79
- They were recruited and randomly assigned into two equal groups: the study group (n = 40) and the control group (n = 40). The control group received standard hospital-based care only, while the study group provided a structured self-learning module in addition to their hospital routine care.

5.3 Tools of the study:

The researchers developed the first tool, adapted the second tool, and adopted the third tool for the study based on an analysis of the relevant related literature **(Abdel-Gawad et al, 2022; Miguel-Reyes et al, 2015)**

5.3.1 Tool (I): "Demographic and respiratory assessment" consisted of two sections.

Section I: Patient's Demographic Characteristics: This section collected data regarding patients' profiles, including age, gender, level of education, marital status, type of current housing, and type of work**.**

Section 2: Interstitial Lung Diseases Patients Respiratory assessment sheet: It included the patient's clinical data, such as past medical history, smoking habits, and current health condition.

5.3.2 Tool (II): "Interstitial lung disease health-related behaviors structured interview schedule" adapted from **(Abdelaziz et al, 2019; Amin et al, 2022).** The interview schedule was structured and self-reported, comprising ten main items that addressed the behaviors of the studied patients to prevent complications and improve their general health. It was used to assess patients' health-related behaviors in relation to the following items: physical activity and exercise regimens, emotions and psychological state, rest and comfort, how to overcome fatigue if present, sleeping, dyspnea and cough relief measures, how to overcome cough, medications, follow-up, diet, and activities of daily living. Each item contains subitems that measure these behaviors. Each response had a three-point Likert scale for patients' health behaviors (1 for "not done", 2 for "sometimes", and 3 for "always"). The total score for each item was calculated, submitted, and converted into a percentage score. The level of patients' health behaviors regarding ILD was presented as follows: less than 60% indicated poor health behaviors, 60% to less than 75% indicated fair health behaviors, and 75% or more indicated good health behaviors.

5.3.3 Tool (III): "Observational checklist of application of therapeutic regimen of ILD patients" adapted from **(Hashem et al, 2018 & Mohammed & Abu Zead, 2023).** It was an observational checklist of the application of a therapeutic regimen, consisting of three parts to assess the steps of using an inhaler (according to its type), pursed-lip breathing exercises, and coughing exercises. Each step was observed and recorded as: done completely = 2, done incompletely = 1, or not done=0. The total score for each item was calculated, submitted, and converted into a percentage score. The level of the patient's application of the therapeutic regimen was interpreted as follows: Less than 60% indicated poor application, 60% to less than 75% indicated fair application, and Equal to or more than 75% indicated good application.

5.4 Ethical consideration

The study obtained written approval from the ethical committee of the Faculty of Nursing at Damanhour University, Egypt, on 23/6/2025, and was assigned the ethical approval code (No.101-f). Official permission was also obtained from the Dean of the Faculty of Nursing at Damanhour University, as well as the administrative authorities of the Damanhour Chest Hospital. Prior to participation, informed consent was obtained from the patients after a clear explanation of the research objectives and procedures was provided. Detailed information regarding the purpose and benefits of the study was provided to the patients, and they had the freedom to participate voluntarily. The study strictly adhered to standard ethical principles, ensuring the maintenance of strict confidentiality and anonymity for all participants during data collection. No risks were posed to the participants.

Tool Validity and Reliability

To ensure the validity of the tools, five experts in medical-surgical nursing and respirology were consulted, and their feedback was incorporated to refine and enhance the clarity and relevance of the tools. The reliability of the developed tools was assessed using the test-retest method, as indicated by Cronbach's alpha coefficient. The Cronbach's coefficient alpha for Tools II and III scores was 0.79 and 0.88, which were accepted as reliable.

5.5 A pilot study:

A pilot study was carried out on 10% of the patient sample (8 patients), who were excluded from the actual study sample in the previously mentioned setting, to to evaluate the clarity, feasibility, and applicability of the developed data collection tools, as well as to identify any

potential challenges that might arise during the actual data collection process. Researchers substituted the excluded sample with another sample that is similar in characteristics to the original sample. The data obtained from the pilot study were analyzed, and the final form of the tools was reconstructed, making them ready for use.

5.6 Data collection

The data collection spanned 9 months (from June 2024 to February 2025). Individual interviews were conducted with each patient using the study tools to collect the data needed for the study objective

5.8 Data collection process:

The study participants were equally divided into two groups: the control group and the study group, with 40 patients in each. To minimize the risk of data contamination, data collection was conducted with the control group prior to the study group. Both groups were initially interviewed using tools I, II, and III to collect their baseline data individually in the inpatient unit. Both groups received hospital routing, which included the prescribed medication and oxygen therapy as required during hospitalization. The study group additionally received hospital routing and the self-learning module.

Conduction of the self-learning module was done as follows:

Preparation of self-learning module:

The researchers comprehensively reviewed the recent evident related literature then developed the self-learning module, which included brief and concise simplified Arabic booklet summarizing ILD including (definition, causes, common types ang manifestations, treatment including prescribed inhaler, breathing and coughing exercises and oxygen therapy at home, healthy behaviors to be followed all the time including avoidance of irritants, breathing exercises, using spirometry, performing exercises and getting enough sleeping time at home. How to relax, cope with stress and discomfort, maintain a healthy diet, recognize danger signs, and know what to do, as well as referral processes.

Additionally, the booklet features illustrative pictures to accompany its content, primarily focusing on health-related behaviors and therapeutic regimens. Simple language and attractive presentation were considered during booklet preparation. The booklet was reviewed by a jury of 5 experts in medical-surgical nursing and respiratory specialists, and the needed modifications were made. Forty booklets were printed and distributed to each patient/caregiver in the study group at the end of the training session, prior to the commencement of the study. The research ensured that the patient could not read and/or that their caregiver could read and use the booklet effectively.

Application of the self-learning module:

The researcher teaches each patient/caregiver individually how to use the booklet independently and explains any unclear aspects. Follow up with the patient and caregiver on a weekly basis, either face-to-face or by phone, to address any questions or concerns. After the patient/caregiver has used and applied the content of the booklet, if the patient needs redemonstration of breathing and coughing exercises or effective use of an inhaler, the researcher provides the necessary direction. Using a self-learning module by the

patient/caregiver weekly for four weeks with continuous guidance and monitoring of the researcher, either face-to-face, online meeting, or by phone call.

Evaluations for patients in both the control and study groups were conducted using tools II and III. It was performed twice: the first evaluation took place two weeks after the initial assessment, and the second evaluation occurred four weeks after the initial assessment. Additionally, evaluations were conducted individually during the inpatient unit and outpatient clinic, according to each patient's presence at the time of evaluation.

5.9 Statistical analysis of the data:

Data analysis was performed using SPSS version 20. Descriptive statistics summarized the data using means and standard deviations for continuous variables, and frequencies and percentages for categorical ones. Group homogeneity at baseline was tested using Chi-square, Monte Carlo exact, and Fisher's exact tests. Repeated measures ANOVA was used to assess within-group changes over time and interaction effects between groups and time points. LSD tests identified specific differences across time points. Effect sizes were measured using partial eta squared (η^2) for interactions and Glass's delta for between-group differences. Pearson's Correlation examined the relationship between health behaviors and adherence to therapeutic regimens. A p-value of less than 0.05 indicated statistical significance, and bar charts were used for visualizing categorical data.

6. Results

The present study's findings illustrate the effect of a self-learning module on health behaviors and the application of therapeutic regimens for patients with interstitial lung disease. These findings are presented in Tables 3, 4, 5, and 6, as well as the levels of therapeutic regimens and health-related behaviors, which are illustrated in Figures 1 and 2.

Table (1) illustrates the percentage distribution of the study and control groups (n = 40 each) across demographic, current housing, and nature of work. Statistical analysis showed no significant differences between the two groups ($p > .05$ for all comparisons). In terms of age distribution, the most essential proportion in both groups fell in the ≥50 age group (47.5% vs. 40.0%). Females were predominant (85.0% in the study group and 80.0% in the control). Education levels were comparably low, with illiteracy rates of 67.5% and 72.5%, respectively. Both groups had similar marital status distributions, with the majority being married or widowed ($p = .575$). The vast majority resided in rural areas (87.5% vs. 90.0%, $p = 1.000$), lived in polluted areas (100%), and had pets or animals at home (97.5% vs. 95.0%). Only a small percentage reported having kitchen hoods (2.5% vs. 10.0%). Most were housewives (80.0% vs. 70.0%). Smoking/dust exposure was nearly universal (100% vs. 95.0%), yet none used protective equipment or changed jobs due to exposure. Financial inadequacy was common in both groups (90.0% vs. 95.0%).

Table (2) outlines the clinical characteristics and current health conditions of the study and control groups (n = 40 each). The table revealed no significant differences between the groups across all listed variables ($p > .05$), confirming their clinical homogeneity. Regarding past health problems, diabetes was the most reported condition (22.5% in the study group vs. 32.5% in the control), followed by hypertension and rheumatoid arthritis. Pneumonia was the most common additional respiratory illness (22.5% in both groups), while family history of interstitial lung disease (ILD) was reported by 20.0% of the study group and 25.0% of the control group. All participants were non-smokers (100%). In terms of disease duration, the

most frequent range was 4–6 years (25.0% of the study group vs. 35.0% of the control group), and all participants reported discovering ILD through symptoms rather than screening. Dyspnea (22.5% vs. 15.0%) and chest pain (55.0% vs. 65.0%) were the most reported initial symptoms. Hospital admission rates in the past year varied, with 40.0% of the study group and 37.5% of the control group reporting 1–4 admissions.

Table (3) comparison of the two study groups' patients' health-related behavioral outcomes pre-and post-application of the self-learning module. A statistically significant interaction effect between group (study vs. control) and time (baseline, 2 weeks, and 4 weeks) concerning various health-related behaviors in patients with interstitial lung disease (ILD). Notably, physical activity and exercise regimens demonstrated the most pronounced change, with an increase in the mean score from 4.13 ± 0.33 at baseline to 8.78 ± 0.83 at the second week ($p < 0.001$), and a large effect size ($\eta^2 = 0.82$). Significant improvements were also recorded in emotions and psychological state, rest and comfort, and fatigue management, with respective effect sizes of $\eta^2 = 0.27$, 0.24, and 0.61. In particular, fatigue management scores rose from 5.80±1.32 at baseline to 10.85±1.45 at the second week in the study group ($p < 0.001$). The domain of dyspnea and cough relief behaviors showed substantial improvement, with a post-intervention mean of 30.43 ± 0.98 compared to 21.12 ± 3.44 in the control group ($p < 0.001$), accounting for 82% of the variance ($\eta^2 = 0.82$). Similarly, medication adherence and dietary practices showed significant improvements post-intervention, with large effect sizes of $\eta^2 = 0.71$ and 0.35, respectively. Although changes in follow-up and activities of daily living were less pronounced, they remained statistically significant over time with moderate effect sizes ($\eta^2 = 0.07$ and 0.124, respectively).

Table (4) comparison of overall health-related behavior scores among study group patients pre- and post-implementation of the self-learning module. This table indicates a statistically significant improvement in overall health-related behaviors within the study group relative to the control group over the observed period. No significant difference was observed at baseline ($p = .885$). After 2 weeks and 4 weeks, the study group exhibited significant improvements, with mean scores of 173.35 ± 5.41 and 167.23 ± 5.33, respectively, compared to the control group's scores of 152.33 ± 8.13 and 152.08 ± 5.33 ($p < .001$ at both intervals). The differences between groups were statistically significant at both post-SLM ($p < 0.001$), with a large effect size ($\eta^2 = 0.60$), indicating that 60% of the variance in behavior scores was attributable to the SLM.

Table (5) comparison between the two study groups in the implementation of the therapeutic regimen for interstitial lung disease patients regarding inhaler use and coughing exercises. This table illustrates a notable improvement in self-management practices for interstitial lung disease (ILD) within the study group following the SLM, particularly in terms of inhaler usage and breathing exercises. No significant differences were observed at baseline between the study and control groups regarding inhaler use ($p = 0.704$), pursed-lips breathing and coughing exercises ($p = 0.541$), or total practice ($p = 0.604$). By 2 weeks and 4 weeks post-SLM, the study group demonstrated significant improvements. The mean scores for inhaler use increased to 27.78 ± 2.64 and 26.50 ± 2.86, in contrast to the control scores of 8.05 ± 1.71 and 8.38 ± 1.73 ($p < .001$) with a large effect size of $\eta^2 = 0.94$. The study group demonstrated improvements in breathing and coughing exercises, achieving scores of 21.40 ± 2.17 and 20.83 ± 2.40, respectively. In contrast, the control group maintained scores of 5.10 ± 0.81 and 5.60 ± 1.10 ($p < .001$ and .001). Overall practice scores demonstrated significant improvement (49.18 ± 3.71 and 47.33 ± 4.05 compared to 13.15 ± 2.15 and 13.98 ± 2.27; $p < .001$ and .002) with a very large effect size ($\eta^2 = 0.96$).

Table (6) presents the Correlation between health-related behaviors and application of the therapeutic regimen among patients with interstitial lung disease. A statistically significant positive correlation was found in the study group between health-related behaviors and the application of the therapeutic regimen ($r = 0.528$, $p < 0.001$). The control group exhibited a negligible and non-significant correlation ($r = .10$, $p = .949$).

Figure (1) Level of application of therapeutic regimen of ILD patients. The bar chart presents the application levels of therapeutic regimens among ILD patients in both the study and control groups across three time points. In the study group, all patients (100.0%) exhibited a deficient level of application prior to the SLM. Following the SLM, a significant improvement was observed, with 75.0% achieving a good level and 25.0% progressing to a fair level. At follow-up, the improvement was sustained, mainly with 55.0% remaining at a good level and 45.0% at a fair level. The control group exhibited no significant changes during the same timeframe.

Figure (2): Level of interstitial lung disease health-related behaviors. The bar chart displays the distribution of ILD patients' application levels of health-related behaviors across three time points in both groups. In the study group, at the pre-SLM phase, 72.5% of patients demonstrated a poor level of behavior application. No participants reached the good level. Following the SLM, at the post-test, there was a marked improvement, with 97.5% of patients progressing to a fair level. This improvement was maintained at follow-up, with 97.5% of participants continuing at the fair level. Conversely, the control group showed no change across the same periods. At pre-test and post-test.

Table (1): Percentage distribution of the study and control groups according to demographic data, current housing, and nature of work (n = 40 for each group)

Items	Category	Study Group		Control Group		Test	P*
		N	%	N	%		
Age (years)	20–<30	1	2.5	0	0	3.56	.327mc
	30–<40	3	7.5	8	20.0		
	40–<50	17	42.5	16	40.0		
	≥50	19	47.5	16	40.0		
Gender	Male	6	15.0	8	20.0	.346	.770f
	Female	34	85.0	32	80.0		
Level of Education	Illiterate	27	67.5	29	72.5	2.36	.729mc
	Read & write	8	20.0	6	15.0		
	Basic education	1	2.5	3	7.5		
	Secondary	3	7.5	1	2.5		
	University	1	2.5	1	2.5		
Marital Status	Single	4	10.0	1	2.5	2.13	.575mc
	Married	12	30.0	15	37.5		
	Divorced	8	20.0	8	20.0		
	Widowed	16	40.0	16	40.0		
Residence	Urban	5	12.5	4	10.0	.125	1.000f
	Rural	35	87.5	36	90.0		
Air pollution near residence	Yes	40	100	40	100	Equal	Equal
	No	0	0	0	0		
Presence of pets/animals at home	Yes	39	97.5	38	95.0	.346	1.000f
	No	1	2.5	2	5.0		
Presence of kitchen hood	Yes	1	2.5	4	10.0	1.92	.359f
	No	39	97.5	36	90.0		
Occupation	Manual	0	0	0	0	3.87	.468mc
	Professional	0	0	2	5.0		
	Housewife	32	80.0	28	70.0		
	Clerical	1	2.5	1	2.5		
	Farmer	1	2.5	0	0		
	Retired	6	15.0	9	22.5		
Type of harmful substances	Cement/ceramics	0	0	0	0	2.05	0.494mc
	Asbestos/Silica	0	0	0	0		
	Smoking/dust	40	100	38	95.0		
	Radiation	0	0	2	5.0		
Changed job due to exposure	Yes	0	0	0	0	Equal	Equal
	No	40	100	40	100		
	Early retirement	0	0	0	0		
Use of protective equipment	Yes	0	0	0	0	Equal	Equal
	No	40	100	40	100		
Monthly income	Enough	4	10.0	2	5.0	.721	.675
	Not enough	36	90.0	38	95.0		

X2 is Pearson chi-square test & mc= Monte-Carlo chi-square test, f is Fisher exact test, P value is significant ≤0.05.

Table (2): Percentage distribution of the study and control groups regarding clinical characteristics, and current health condition (n = 40 for each group)

Items	Category	Study Group		Control Group		Test	P*
		N	%	N	%		
Past health problems	Diabetes	9	22.5	13	32.5	2.06	0.860mc
	Hypertension	7	17.5	5	12.5		
	Heart disease	2	5.0	2	5.0		
	Cancer	2	5.0	1	2.5		
	Liver/kidney disease	0	0	0	0		
	GERD	0	0	0	0		
	Rheumatoid arthritis	5	12.5	7	17.5		
	No	15	37.5	12	30.0		
Other respiratory diseases	TB	0	0	0	0	.111	1.000mc
	Pneumonia	9	22.5	9	22.5		
	Pleural effusion	0	0	0	0		
	COPD	0	0	0	0		
	Asthma	5	12.5	6	15.0		
	No	26	65.0	25	62.5		
Family respiratory diseases	TB	0	0	2	5.0	3.39	.616mc
	Pleural effusion	0	0	0	0		
	ILD	8	20.0	10	25.0		
	COPD	3	7.5	3	7.5		
	Asthma	1	2.5				
	No	28	70.0	25	62.5		
Smoking habits	Smoker	0	0	0	0	Equal	Equal
	Non-smoker	40	100	40	100		
Duration of ILD	<1 year	4	10.0	6	15	3.12	.871mc
	1–3 years	10	25.0	6	15		
	4–6 years	10	25.0	14	35		
	7–10 years	4	10.0	4	10		
	>10 years	12	30.0	10	25		
Discovery of ILD	Accidentally	0	0	0	0	Equal	Equal
	Health checkup	0	0	0	0		
	Symptoms	40	100	40	100		
Initial symptoms	Dyspnea	9	22.5	6	15.0	1.55	.844mc
	Dry cough	0	0	0	0		
	Fatigue	4	10.0	3	7.5		
	Chest discomfort	22	55.0	26	65.0		
	Cyanosis	4	10.0	3	7.5		
	Others	1	2.5	2	5.0		
Action upon symptoms	Did nothing	7	17.5	6	15.0	.093	1.000mc
	Visited doctor	31	77.5	32	80.0		
	Popular remedies	2	5.0	2	5.0		
Hospital admissions (last year)	Once	11	27.5	10	25.0	.247	.966mc
	1-<5 times	16	40.0	15	37.5		
	5–10 times	11	27.5	13	32.5		
	>10 times	2	5.0	2	5.0		

X2 is Pearson chi-square test & mc= Monte-Carlo chi-square test, f is Fisher exact test, P value is significant ≤0.05

Table (3): Comparison of the two study groups' patients' health-related behavioral outcomes pre-and post-application of self-learning module.

Variables	Study G. (n= 40)	Control G. (n=40)	Sig.b &delta
	Mean±SD	Mean±SD	
1. Physical activity and exercise regimens			
Baseline	4.13±.33	4.10±.30	.728 (.1)
2 weeks	8.78±.83	4.10±.30	**<.001 (7.50)**
4 weeks	6.68±1.10	4.05±.22	**<.001(3.32)**
F (Pvalue) (η2)	**342.53 (<.001), η^2(.82)**		
2. Emotions and psychological state			
Baseline	13.57±1.38	13.20±1.40	.230 (.27)
2 weeks	11.65±1.23	13.08±1.49	**<.001(1.05)**
4 weeks	12.05±1.47	13.17±1.43	**.001(.77)**
F (P value) (η2)	**28.70 (<.001), η^2(.27)**		
3. Rest and comfort			
Baseline	2.98±.16	2.95±.22	.562(.16)
2 weeks	2.42±.50	2.95±.21	**<.001(1.38)**
4 weeks	2.60±.50	2.90±.30	**.002(.73)**
F (P value) (η2)	**24.80 (<.001), η^2(.24)**		
4. How do you overcome fatigue if present?			
Baseline	5.80±1.32	5.80±1.36	1.000(0)
2 weeks	10.85±1.45	5.80±1.36	**<.001(3.58)**
4 weeks	8.62±1.85	5.77±1.27	**.002(1.79)**
F (P value) (η2)	**120.83 (<.001), η^2(.61)**		
5. Sleeping			
Baseline	11.87±1.04	11.87±1.28	1.000 (0)
2 weeks	11.17±1.20	11.90±1.28	**<.011(.59)**
4 weeks	11.30±1.14	11.60±1.19	**.253(.26)**
F (P value) (η2)	**4.71 (.012), η^2(.06)**		
6. Dyspnea and cough relief measures			
Baseline	21.03±3.67	21.13±3.44	.90 (.03)
2 weeks	30.43±.98	21.12±3.44	**<.001(3.68)**
4 weeks	28.85±1.48	21.13±3.44	**<.001(2.91)**
F (P value) (η2)	**77.00 (<.001), η^2(.82)**		
7. Medications			
Baseline	9.88±1.24	9.77±1.25	.721(.11)
2 weeks	13.23±1.25	**9.78**±1.25	**<.001(2.76)**
4 weeks	12.98±1.42	9.85±1.31	**.002(2.30)**
F (P value) (η2)	**77.00 (<.001), η^2(.71)**		
8. Follow up			
Baseline	10.70±.59	10.35±.58	.703 (.60)
2 weeks	10.55±.68	10.35±.58	.160(.32)
4 weeks	10.45±.65	10.34±.57	.173(.61)
F (P value) (η2)	**5.74 (.007), η^2(.07)**		
9. Diet			
Baseline	4.95±1.15	5.05±1.06	.688(.09)
2 weeks	6.68±.88	5.04±1.06	**<.001 (1.69)**
4 weeks	5.64±1.23	5.05±1.06	**<.001(.51)**
F (P value) (η2)	**42.14 (<.001), η^2(.35)**		
10. Activities of daily living			
Baseline	69.30±4.78	68.50±5.84	.505(.15)
2 weeks	66.60±4.55	67.20±5.41	.593(.12)
4 weeks	66.38±4.49	67.20±5.41	.460(.16)
F (P value) (η2)	**11.01 (.001), η^2(.124)**		

Table (4): comparison of overall health-related behavior scores among study group patients pre and post implementation of the self-learning module

Variables	Study G. (n= 40)	Control G. (n=40)	Sig.b &delta
	Mean±SD	Mean±SD	
Health-related behaviors			
Baseline	153.45±8.51	153.73±8.42	.885 (.03)
2 weeks	173.35±5.41	152.33±8.13	<.001 (2.59)
4 weeks	167.23±5.33	152.08±5.33	<.001(2.84)
F (P value) (η2)	**116.65 (<.001), η^2(.60)**		

F test is repeated measures ANOVA, P value is significant <.05, **η2** is Partial Eta Squared, Sig.[b]→ b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). Delta is Glass's delta effect size.

Table (5): Comparison between the two study groups in the implementation of the therapeutic regimen for interstitial lung disease patients regarding inhaler use and coughing exercises.

Variables	Study G. (n= 40)	Control G. (n=40)	Sig.b &delta
	Mean±SD	Mean±SD	
Inhaler use			
Baseline	8.13±1.79	7.98±1.73	.704 (.09)
2 weeks	27.78±2.64	8.05±1.71	**<.001 (11.54)**
4 weeks	26.50±2.86	8.38±1.73	**<.001(10.47)**
F (P value) (η2)	**1135.78 (<.001), η^2(.94)**		
Pursed lips breathing and coughing exercise.			
Baseline	5.23±.99	5.10±.81	.541 (.16)
2 weeks	21.40±2.17	5.10±.81	**<.001(20.12)**
4 weeks	20.83±2.40	5.60±1.10	**.001(13.85)**
F (P value) (η2)	**1317.46 (<.001), η^2(.94)**		
Total application of therapeutic regimen of ILD patients			
Baseline	13.35±2.51	13.08±2.20	.604(.12)
2 weeks	49.18±3.71	13.15±2.15	**<.001(16.78)**
4 weeks	47.33±4.05	13.98±2.27	**.002(14.67)**
F (P value) (η2)	**2075.89 (<.001), η^2(.96)**		

F test is repeated measures ANOVA, P value is significant <.05, **η2** is Partial Eta Squared, Sig.[b]→ b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). Delta is Glass's delta effect size.

Table (6): Correlation between health-related behaviors and application of the therapeutic regimen among patients with interstitial lung disease

Items	Application of therapeutic regimen of ILD patients			
	Study (40)		Control (40)	
	R	Sig.	R	Sig.
Health-related behaviors	.528	**<0.001***	.10	.949

r is Pearson correlation test & P is significant <.05

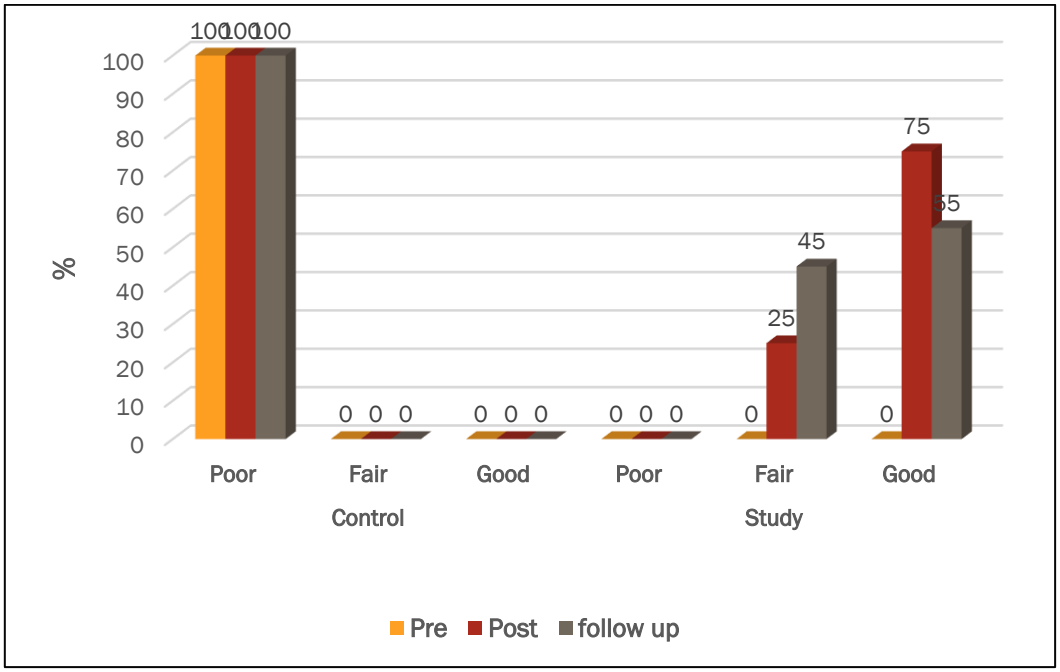

Figure (1): Level of application of therapeutic regimen of ILD patients

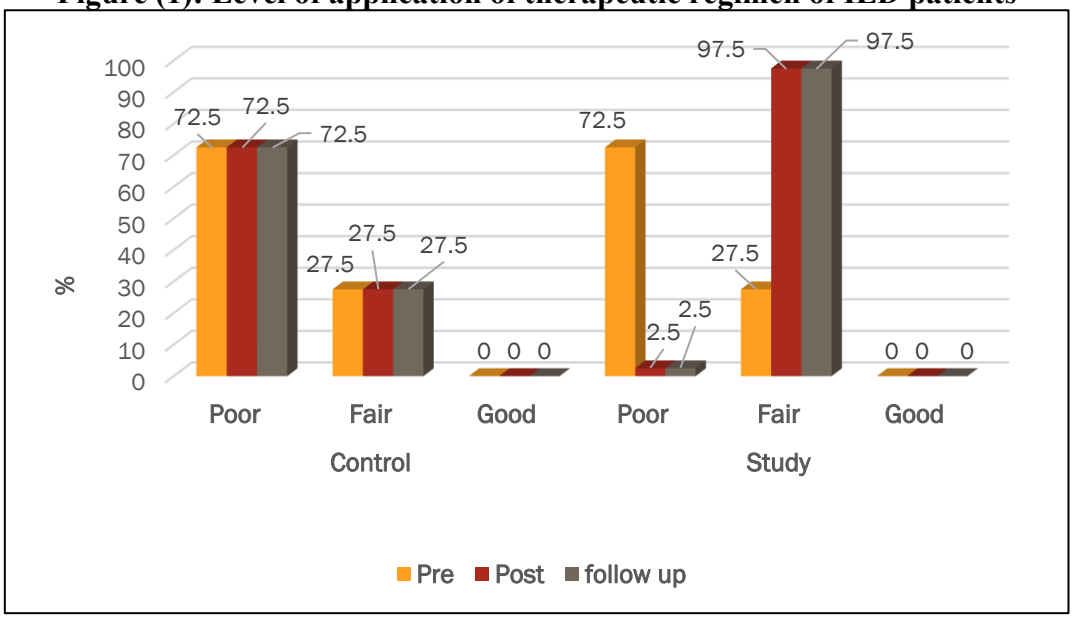

Figure (2): Level of health-related behaviors of ILD patients

7. Discussion:

Interstitial lung diseases (ILDs) are a term that includes more than 200 different diseases. In their pathogenesis, various factors, including environmental and occupational agents, infections, drugs, radiation, and genetic predisposition, have been implicated. However, the majority of these diseases are considered idiopathic. Understanding ILDs can be challenging due to their generally uncommon prevalence and complex terminology. For patients with ILDs, there are few educational resources currently available, and none have been systematically developed for in-person delivery (**Hilberg et al., 2022).**

The current study was conducted to evaluate the effect of a self-learning module on health behaviors and the application of a therapeutic regimen in patients with ILD. The current study's results showed no statistically significant differences between the control and study groups in terms of demographic and clinical data. This finding indicated that patients in both groups had similar characteristics, were distributed homogeneously, and were randomized correctly. This result supports the internal validity of the study, allowing for a more accurate attribution of any post-intervention differences to SLM.

A notable demographic identified in the study population was the high rate of illiteracy, which posed a significant barrier to patient comprehension and independent utilization of written health education materials. Therefore, it is essential to emphasize that the effective implementation of the self-learning module was facilitated by the involvement of educated caregivers, who played a crucial role in verbally explaining and guiding patients through the content. The support provided by nurses and care providers was essential to ensuring patient understanding, retention of information, and subsequent behavioral changes. This finding is supported by recent evidence emphasizing that health education interventions are most effective when tailored to patients' literacy levels and supported through interpersonal communication with trained healthcare providers.

According to **Sørensen et al. (2021),** health literacy is a dynamic construct that depends not only on individuals' abilities but also on the accessibility and clarity of information provided by healthcare systems and professionals. Therefore, in populations with low literacy, the presence of knowledgeable care providers who can translate educational content into understandable formats plays a pivotal role in improving patient outcomes. The success of the SLM in this study can thus be attributed not only to the content itself but also to the delivery approach, which actively addressed the educational limitations of the target population.

In the present study, no significant differences were found between the study and control groups. However, health behavior domains improved more in the study group than in the control group after the implementation of SLM. Highly significant improvements were found in all health behavior domains. Such a change was not observed among the control group after the implementation of routine hospital care. These findings highlighted the importance of early, structured, and nurse-led interventions in improving overall health-related behaviors in ILD patients. The significant behavioral improvement observed over two weeks underscores the responsiveness of patients to targeted education and behavioral support. However, the slight drop by the fourth week may indicate the beginning of regression, implying that ongoing reinforcement and follow-up are essential to sustain behavioral gains. This research depicts integrating behavior-focused modules into standard ILD management pathways to support long-term adherence and self-efficacy.

The findings of the current study align with a study conducted by **Santos et al. (2024),** who demonstrated that structured behavioral interventions, when delivered early in chronic pulmonary care, led to significant and sustained improvements in self-management behaviors and quality of life in patients with fibrotic lung disease. Their study emphasized the value of multidisciplinary care and behavior reinforcement in preserving the gains achieved during early intervention phases. This structure aligns with previous findings by **Salazar et al. (2025)**, who emphasized that physical training programs can lead to meaningful improvements in functional capacity and quality of life in ILD patients, even over short durations.

Moreover, additional research by **Booth, S., & Johnson, M. J. (2019)** revealed that early symptom control education significantly enhances patients' ability to self-manage breathlessness, improving daily quality of life. Conversely, **Morisset et al. (2016)** argued that improvements in self-reported behaviors do not always reflect long-term adherence or improved clinical outcomes. Their longitudinal study in ILD patients showed initial improvements in health behaviors that gradually diminished after 4–6 weeks without continuous coaching or monitoring. This finding aligns with the current study's slight decline at the 4-week mark, reinforcing the need for extended behavioral support beyond the initial intervention.

Regarding the application of the therapeutic regimen for ILD patients, the study results indicated no statistically significant difference between the two groups in all domains: inhaler use, pursed-lip breathing, and coughing exercises, prior to the implementation of SLM. At the same time, the study groups' total mean application of the therapeutic regimen for ILD patients increased significantly compared to the control groups at 2 and 4 weeks after the implementation of SLM. This result may be related to the strong support for the use of structured therapeutic education and skill-based training as effective strategies in the management of ILD. The use of repeated measures over time provided robust evidence of sustained improvement, and the consistency of high effect sizes across all outcome variables demonstrates the clinical relevance of the module.

Additionally, the focus on self-administered techniques, such as inhaler use and breathing exercises, reflects a patient-centered approach that aligns with best practices in chronic disease management. These techniques empower patients to actively participate in their care, potentially improving long-term outcomes, quality of life, and reducing healthcare utilization. These results are consistent with prior studies emphasizing the role of multimedia education and patient engagement in pulmonary disease management (**Mohammed et al., 2023).**

Similar to the results of this study, **Bakr et al. (2024)** found that the educational module had a positive impact on improving the practice of inhaler therapy, medication adherence to inhalation, and reducing dyspnea episodes and severity among the study group (Group I) compared to the control group (Group II). Additionally, **To, Ka Wing. (2017)** noticed that different combinations of education-based adherence interventions exhibited various effects on CRD patients. Additionally, the pilot study results showed that implementing the information, motivation, and behavioral skill model-based education program adherence intervention in Hong Kong clinical settings was feasible, and it may also improve COPD patients' adherence to their inhalation treatment. The significant improvement observed in such a short period (two to four weeks) highlights the potential of intensive educational and behavioral interventions in respiratory therapy.

One of the study's most notable findings was a statistically significant positive correlation between health-related behavior scores and the application of the therapeutic regimen for the

studied interstitial lung disease patients ($p < 0.001$). This finding may be rationalized by the fact that individuals who received a self-learning module are more likely to understand the necessity of lifestyle changes and are more motivated to perform correct health behaviors to improve their health status, prevent complications of disease, and reinforce the concept that structured educational interventions can effectively influence clinical practice in chronic disease management. This result agrees with **Wang et al. (2017)**, who emphasized that patient education interventions, particularly those that support self-management, are strongly associated with improved treatment adherence in chronic respiratory disease. Moreover, **Amin et al. (2024)** reported that structured education enables patients to link their knowledge with actions, resulting in improved inhaler technique, better symptom control, and reduced hospitalizations. These findings align with existing evidence that educational interventions improve not only knowledge but also behavior-practice alignment, particularly in chronic respiratory conditions, where patient participation is critical **(Mair et al., 2023).** Furthermore, this result is consistent with Gazzar et al. (2025), who reported that intensive nurse-led educational interventions and individualized follow-up can significantly improve adherence among patients with ILD, leading to higher levels of regimen adherence.

Finally, the results obtained have demonstrated that self-management education in ILD is not an option; nurses have a responsibility to ensure that everyone with ILD receives personalized advice to enable them to optimize their condition management. Additionally, the findings of the current study clarified the fact that the self-learning module has a positive effect on patients' knowledge, health behavior, & adherence to the therapeutic regimen among ILD patients. Therefore, patients with interstitial lung disease who undergo the self-learning module will exhibit better health-related behavior and a more effective application of the therapeutic regimen than those who do not.

8. Conclusion and recommendations

8.1 Conclusion

Based on the findings of the current study, it is notable that the majority of patients in the study group showed a statistically significant improvement in total mean scores of health behaviors and application of the therapeutic regimen compared to the control group after two and four weeks of implementing the SLM.

8.2 Recommendation

- A self-learning module is designed systematically and continuously for patients with ILD. In hospitals, it is supplemented by various media, including WhatsApp groups, television, and other channels, to enhance the health status of these patients.
- For patients with ILD, an education session should be initiated from the first day of their hospital admission, followed up at an outpatient clinic by a pulmonary nurse practitioner.
- Provide a comprehensive, simple, and illustrated handout to patients newly diagnosed with ILD, to be distributed upon admission**.**
- Respiratory care nurses should integrate behavior-focused modules into standard ILD management pathways to support long-term adherence and self-efficacy.
- The current study should be replicated using a larger statistical sample size to draw more broadly applicable conclusions from various areas and a longer follow-up time.

9. Limitations of the study

This study highlighted the limitations of the challenges associated with transporting patients to the outpatient clinic for follow-up. Consequently, home-based SLM may be more effective and beneficial, particularly with the use of recent telecommunication to supervise and guide.

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الملخص العربي

تأثير نموذج التعلم الذاتي علي السلوكيات الصحية وتطبيق النظام العلاجي بين المرضي المصابين بأمراض الرئة الخلالية

مقدمة: يُعدّ مرض تليّف الرئه الخلالي مجموعة من الاضطرابات التنفسية المزمنة التي تتسم بحدوث التهابات وتليّف في النسيج الخلالي للرئة، وهو النسيج الداعم للحويصلات الهوائية. ويؤدي هذا التغير المرضي إلى تصلب تدريجي في أنسجة الرئة، مما يُعيق تمددها الطبيعي ويُضعف كفاءة تبادل الغازات، وخاصة الأكسجين. ينعكس هذا التأثير سلباً على القدرة الوظيفية للمريض ويُقلل من جودة حياته، كما يرتبط بارتفاع معدلات المرض والوفيات. وتُعدّ الاستراتيجية المثلى في التعامل مع المرض قائمة على التشخيص المبكر، والمتابعة الطبية الدقيقة، والتأهيل الرئوي، إضافة إلى تثقيف المرضى، حيث تسهم هذه الجوانب مجتمعة في الحد من تقدم المرض وتحسين المخرجات السريرية ونوعية الحياة لدى المصابين.

هدف الدراسة :تقييم تأثيرنموذج التعلم الذاتي على السلوكيات الصحية وتطبيق النظام العلاجي بين المرضي المصابين بأمراض الرئة الخلالية.

عينة وطرق البحث :تم استخدام تصميم بحث شبه تجريبي أُجريت هذه في قسم الصدرية والعيادات الخارجية بمستشفى صدر دمنهور.البحيره. تم اختيار عينة ملائمه من 80 مريض و مريضة مصابين بأمراض الرئة الخلالية وقد تم اختيارهم وفقا للمعايير ، وتم توزيعهم عشوائياً بالتساوي إلى مجموعتين (مجموعة دراسة ومجموعة ضابطة).

الأدوات :تم استخدام ثلاث أدوات لجمع البيانات:

الأداة الأولى: "استمارة تقييم الخصائص الديموغرافية والجهاز التنفسي."

الأداة الثانية: "استبيان تقييم السلوكيات الصحية المرتبطة بمرض الرئة الخلالية" وهو مقابلة منظمة قائمة على استبانة ذاتية.

الأداة الثالثة: "قائمة الملاحظة لتقييم تطبيق النظام العلاجي لدى مرضى مصابين بأمراض الرئة الخلالية والتي تم استخدامها لتقييم خطوات استخدام البخاخات، وأداء تمارين التنفس باستخدام الشفاه المضغوطة، وتمارين السعال.

النتائج :أظهرت الدراسة تحسنًا كبيرًا في السلوكيات الصحية وممارسات الإدارة الذاتية لدى مجموعة الدراسة مقارنة بالمجموعة الضابطة بعد تطبيق نموذج التعليم الذاتي. كما أظهرت مجموعة الدراسة مستويات رضا أعلى، مع وجود ارتباط إيجابي قوي بين تحسن السلوكيات الصحية والالتزام بتطبيق النظام العلاجي ($r = 0.528, p < 0.001$)، في حين لم يتم العثور على تغييرات ذات دلالة إحصائية في المجموعة الضابطة.

الاستنتاج :استنادًا إلى نتائج الدراسة الحالية، يُلاحظ أن غالبية المرضى في مجموعة الدراسة أظهروا تحسنًا ذا دلالة إحصائية في المتوسط الكلي لدرجات السلوكيات الصحية وتطبيق النظام العلاجي مقارنةً بالمجموعة الضابطة، وذلك بعد أسبوعين وأربعة أسابيع من تطبيق نموذج التعلم الذاتي .

التوصية :يُوصى بتصميم نموذج التعليم الذاتي بشكل منهجي ومستمر لمرضى الرئة الخلالية، على أن يتم تدعيمه بوسائل مختلفة في المستشفيات مثل مجموعات الواتساب، التلفزيون، وغيرها من القنوات لتحسين الحالة الصحية لهؤلاء المرضى.