Effect of Mindfulness-Based Program and Perceived Self-Efficacy for Patients with Lung Cancer: An Intervention Study

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Abstract

Background: Mindfulness-based program incorporating meditation practices and self-efficacy are gaining popularity among cancer patients. The current study aimed to evaluate the effects of a mindfulness-based program and perceived self-efficacy for patients with lung cancer. **Methods:** A quasi-experimental study was conducted in the outpatient clinics and nuclear medicine clinic at the New Cancer Institute at Menoufia University, Shebien Elkom City, Egypt. A purposive sample of 160 patients with lung cancer was enrolled, from whom data were collected through 5 tools: Tool (1): Structured interview questionnaire including demographic and medical data, Tool (2): Condensed Memorial Symptom Assessment Scale (pre/post), Tool (3): Eastern Cooperative Oncology Group Performance Status (pre/post), Tool (4): Self-Efficacy Pulmonary Rehabilitation Adapted Index (pre/post) and Tool (5): Questionnaire about mindfulness which includes knowledge, reported practice and five-facet mindfulness (pre/post). **Results**: This study displayed statistically significant improvements in symptoms (5.65 ± 1.33 to 3.00 ± 1.36), performance status (1.75 ± .83 to 2.25 ± .86), mindfulness (18.62 ± 2.32 to 29.75 ± 4.06), breathing meditation (1.17 ± 1.64 to 5.70 ± 1.60), self-efficacy (20.37 ± 2.93 to 33.32 ± 5.11), and knowledge (1.65 ± 2.36 to 13.17 ± 2.004) for patients with lung cancer after program application. **Conclusion:** Implementation of a mindfulness-based program and perceived self-efficacy have positive effects on improving physical and psychological symptoms, breathing meditation practice, performance status, and knowledge among lung cancer patients.

Keywords: Intervention study, Lung Cancer, Mindfulness-Based Program, Perceived Self-efficacy

Introduction

Lung cancer remains the leading cause of mortality and morbidity worldwide, with estimates showing that the number of cases will reach 1 million by approximately 2025 if no effective actions are taken **(Hyuna et al., 2021; WHO 2021).** Data from 2018 showed that lung cancer was the most common type of cancer worldwide, with 2.206 million cases accounting for 11.4% of new cases, and caused the highest number of deaths at 1.796 million cases accounting 18% of all deaths. Dyspnea is an upsetting symptom that occurs quit often, causing considerable burden on the patients, health care providers, and society **(El-Turk et al., 2021).**

Bandura defines self-efficacy as one's ability to perform certain actions in specific situations with high confidence and the belief that one can achieve an action as a plan to influence predictable outcomes established from the following four sources; enactive mastery experiences linking sources that have the highest influence on behavior modification, vicarious experiences connecting to view the models or experiences of other people who have the same illness, verbal persuasion foremost of belief that a person can perform, and physiological states **(Hendricks, 2016)**.

Patients with cancer are less able to manage their medical issues, are more susceptible to unfavorable consequences, and are more likely to experience low self-efficacy. Self-efficacy is one's assessment of and confidence in their capacity to successfully address potential future obstacles. Physical, psychological, and emotional transition associated with lung cancer patients undergo stages at the times of analysis, operation,

hospitalization, and discharge and as daily life homecoming. So, self - efficacy has been advocated to support the needs of patients with lung cancer at these critical moments and reduce symptom burden to increase function. Evidence displays that mindfulness programs help to improve exercise capacity, breathlessness, tiredness, discomfort, psychosomatic distress, and quality of life **(Rutkowska et al., 2021).**

According to the self-efficacy theory, people are more likely to engage in tasks they feel competent to complete and avoid those they feel incompetent to complete. For cancer patients to manage treatment-related physical, social, and psychological issues and to adjust to new life circumstances, self-efficacy is of utmost importance. Therefore, it should be viewed as a crucial component of wellbeing and success in symptom control **(Goldsmith et al, 2021)**.

Mindfulness is a Buddhist concept that refers to the experience of emotional balance and openness needed to perceive the present moment in a non-reactive, non-judgmental manner, in contrast to the sensation of reacting to experience automatically, past dwelling, and future worrying, which is common among people facing a life-threatening diagnosis like cancer. The ability to engage in mindfulness awareness has been associated with reduced psychological distress and physical health symptoms especially in populations with chronic illness **(Cho et al., 2021).**

Major cause of physical psychological distress, such as pain, sleeplessness, nervousness and depressive symptoms is a receiving diagnosis of lung cancer. Rendering to the new research writings, the training of mindfulness can help people manage related physical and psychological symptoms and cope with cancer **(Niedzwiedz et al., 2019)**. The profits of meditation begin from self-regulatory learning skills and self-awareness increasing, to manage emotions and thoughts, and refining the capacity to accept life experiences as they occur. Efforts are needed to improve self-efficacy through training to increase self-confidence in problems overcoming and improve life quality **(Hu, 2017).**

As a result, nurses are crucial in the development of behaviors that promote health. Additionally, nurses oversee factors including continuing with daily activities, improving success rates, adjusting to change, enlisting the aid of family and other support systems, and motivating and educating patients. As a result, nurses help cancer patients perceive their self-efficacy **(Nwozichi et al., 2020).**

Significance of the study

Lung cancer is one of the most common malignancies, accounting for 5.0%–7.0% of all cancers in Egypt. The incidence of lung cancer had increased from 11.9 to 63.3 and from 3.7 to 13.8 per 100,000 individuals during the period from 1980 to 2014 among men and women, respectively. Moreover, lung cancer remains the leading cause of death, accounting for 25.0% of all cancer deaths worldwide. From 2010 and 2014, the mortality rate increased from 9.1 to 32.4 and from 2.3 to 12.4 per 100,000 individuals among males and females, respectively **(Dubey et al., 2019)**.

Community health, psychiatric health and medical surgical nurses considered as the most health care team members that are valuable, who address dimensions of care for cancer patients as physical, functional, social, spiritual and have a social role in advocating patients right and providing the patient and populations with general knowledge, positive attitudes, and good performance about cancer preventive and curative programs, early diagnosis and the most recent modalities for treatment, mindfulness practices is an crucial component of high-quality cancer management, counting management for pain, psycho-oncology constructions, mystical provision and symptom control for cancer patients delivered and provided by the nurse **(Watson et al., 2019)**.

Aim of the Study

The present study aimed to evaluate the effects of a mindfulness-based program and perceived self-efficacy for patients with lung cancer: an intervention study through:

- Assessing patients' physical and psychological symptoms pre and post program implementation.
- Appraising knowledge and reported practice

scores regarding mindfulness pre and post program implementation.

- Determining patients' self-efficacy scores pre and post program implementation.
- Planning, implementing and evaluating the effects of a mindfulness-based program and perceived self-efficacy among patients with lung cancer.

Research hypotheses:

- Patients with lung cancer who receive the mindfulness-based program and perceived self-efficacy would exhibit improvements in physical and psychological symptoms.
- Patients with lung cancer who receive the mindfulness-based program and perceived self-efficacy would exhibit significant improvement in self-efficacy and mindfulness scores.

Method

Study design

This study was conducted using a quasi-experimental research design. Quasi-experimental design involves selecting groups, upon which a variable is tested, without any random pre-selection processes **(Gopalan, Rosinger & Ahn, 2020).**

Setting

This study was carried out in the New Cancer Institute at Menoufia University in Shebien Elkom City, Egypt, in the outpatient clinics and nuclear medicine clinic.

The five levels of the New Cancer Institute are where cancer patients receive chemo, palliative care, or follow-up care. The ground floor of the cancer institute houses the outpatient clinics where cancer patients receive follow-up care. On the second floor of the facility, chemotherapy is administered to cancer patients. Additionally, the new cancer institution is home to a nuclear medicine clinic with one floor where cancer patients get radiotherapy.

Group size, type, and technique

The required group size was determined to be 160 based on the following equation:

$$n = \frac{t^2 \times p\,(1 - p)}{M2}$$

n = required group size
t = confidence level at 95%
p = estimated population
m = margin of error at 5%

A Purposive sample of 160 patients with lung cancer was selected from a total of 278 affected patients in the previous year. Patients included if ready to fully participate in the study and excluded if had uncontrollable dyspnea, pleural effusion, necessitating drainage treatment, lung tuberculosis, myocardial infraction, and have neuro-musculoskeletal abnormalities.

Tools for data collection

Data for patients with lung cancer were collected using 5 tools as follows:

Tool 1: Structured interview questionnaire regarding demographic data and medical history

This tool was divided into 2 parts:

Part one

This part aimed to assess patients' demographic characteristics, which included sex, age, education level, marital status, living area, employment status, and household income (7 items).

Part two: Medical history

Part two included patient's medical history such as lung cancer stage, time since diagnosis and type of treatment received, smoking and family history (5 items).

Tool 2: Condensed Memorial Symptom Assessment Scale (CMSAS)

This tool was adopted from **Chang et al., (2004)** to assess the physical and psychological symptoms of cancer patients. Two subscales had been proposed, namely physical symptom distress subscale (CMSAS PHYS), which contains the first 11 symptoms (i.e., shortness of breath, pain, nausea, appetite lack, weight loss, difficulty sleeping, constipation, lack of energy, dry mouth, drowsy, and concentrating disturbance), and the psychological distress subscale (CMSAS PSYCH), which contains 3 symptoms (i.e., nervousness, worry, and

sadness). One point was awarded when a symptom was present, whereas no point was awarded when no symptom was present. The total symptom score was determined by adding all 14 symptoms, after which the mean and standard deviation before and after the program was calculated.

Tool 3: Eastern Cooperative Oncology Group, Performance Status (patient self-reported ECOG score)

This tool was adopted from **Oken et al., (1982)** to assess whether cancer patients were fully active, physically restricted, ambulatory and capable of all self-care, capable of only partial self-care, disabled completely, and dead.

This tool utilized a 6-point numerical measure, with scores ranging from 0 (normal functional status) to 5 (death). The total score was calculated as is the sum of all items, after which the mean and standard deviation before and after the program was determined. Patients with an ECOG score of 0 or 1 were considered to have good performance status, whereas those with an ECOG score of 2 or more were considered to have poor performance status.

Tool 4: Self-Efficacy Pulmonary Rehabilitation Adapted Index (PRAISE)

This self-efficacy tool was adopted from **Santos et al., (2019)** to identify important elements of successful behavior modification in lung cancer patients. It consisted of 4 factors with a total 15 items.

This tool determined overall self-efficacy based on the following seven items: consistently solving difficult problems if persistent, addressing individuals wanting to compete, easily clinging to intentions and achieve goals, confidence in walking a good distance at one's own pace although expecting to be out of breath, assurance of one's ability to efficiently deal with unexpected events, recognizing methods for dealing with unforeseen situations given the available resources, and performing exercises necessary during rehabilitation even if difficult.

Two items determined an individual's belief regarding their own capacities: solving most problems after investing the necessary effort and perception of adequate knowledge regarding lung disease despite being a complex health problem. Performance accomplishment contained three items, namely facing difficulties and remaining calm by trusting one's abilities, usually finding several solutions when faced with a problem, and completing the exercises at home despite no supervision by a health professional. Coping either as a trait or strategy contained three items, newly frequently thinking of a solution, usually doing everything that comes one's way, and feeling that one's lung disease and the way it affects lifestyle are controlled on a daily basis even when the symptoms become more distressing.

A three 3-point Likert-scale was used, ranging from (not at all true, not sure, and exactly true). Every item was scored from 1 to 3, with the total ranging from 15 to 45. Higher scores indicated more advanced levels of self-efficacy. The total score for the factors and subitems were summed, after which the mean and standard deviation were determined to compare total and subtotal self-efficacy scores before and after program implementation.

Tool 5: Questionnaire about Mindfulness

This questionnaire included 3 parts to assess patients' knowledge and reported practice regarding mindfulness (meditation).

Part one: Patients' knowledge regarding mindfulness

This part was adapted from **Williams et al., (2011)** and **Goyal et al., (2014)** to assess patient's knowledge regarding mindfulness. It included 10 items assessing meaning, benefit, and process of meditation. Each item was awarded a score of 2, 1, and 0 points for agree, not sure, and not agree, respectively. The rating scale for all questions was collected. The total score ranged from 0 to 20 points. The total grades were summed, and all scores were transformed into percentage. Thereafter, the total scores were transferred into the following categories:

Poor knowledge = (<50%), 0 ≤ 10 points

Average knowledge = (50%–75%), 10–15 points

Good knowledge = (>75%), >15–20 points

Part two: Five-Facet Mindfulness Questionnaire (FFMQ-15)

A 15-item Five-Facet Mindfulness Questionnaire was adopted from **Baer et al., (2008)**, with each facet including three items.

Observation (direct score) included staying alert to the sensations of water on one's body when taking a bath, understanding how food and drinks affect thoughts, bodily sensations, and feelings, and considering sensations such as the sun on one's face and the wind in one's hair.

Description (reversed score) included good at finding words to describe feelings, have trouble thinking of the right words to express how one feels about things, and finding a way to communicate even when feeling terribly upset.

Aware actions (reversed score) involved not paying attention to one's actions due to fantasizing, being disturbed, and being unfocussed, performs work or jobs automatically without being aware of one's actions and finding oneself not paying attention to one's actions.

Non-Judging of inner experience (reversed score) included should not think in a negative way when relying on some thoughts that are abnormal or bad, should not feel bad or inappropriate emotions, and telling myself I should not be feeling this way.

Inner experience non-reactivity (direct score) involved having upsetting thoughts or imaginings and attentive to the thought without getting taken over by it (i.e., "stepping back"), noticing distressing images without reacting, and noticing distressing thoughts or images and letting them go.

A 3-point Likert-scale ranging from (never true, sometimes true, and often true) was used. Each item was scored from 1 to 3 considering reversed items, with the total score ranging from 15 to 45. The total facet score and subitems were determined, after which the mean and standard deviation were calculated to compare total and subtotal mindfulness scores before and after program implementation.

Part three: Patients' reported practice regarding breathing meditation

This part which was adapted from **Liang et al., (2020)** aimed to assess patient's practice regarding breathing meditation and included the following 9 steps: sitting upright with both feet on the ground, closing one's eyes, noticing the physical points of contact between you and the chair, paying attention to one's breathing, noticing the sensation of the floor against one's feet, inhaling through one's nose and having shortness of breath, bringing one's attention back to breathing, and thanking oneself for taking the time to self-care.

Each step was awarded 1 point when done and zero points when missed. The rating scale of all questions was collected. The total score ranged from 0 to 9 and the total subitem score was summed, after which the mean and standard deviation were calculated to compare total and subtotal patient's practice scores regarding breathing meditation before and after program implementation.

Validity and reliability

Content validity was verified by a jury of five experts in the fields of medical surgical nursing, community health nursing and psychiatric health nursing. The experts reviewed the tools for clarity, relevance, completeness, simplicity, and applicability, after which minor changes were made. Reliability testing of the anticipated tools was performed using Cronbach's alpha to measure the tool's internal consistency. Accordingly, CMAS had a Cronbach's alpha coefficient of 0.82, whereas the PRAISE tool had a correlation coefficient of 0.78 for the Five-Facet Mindfulness Questionnaire and 0.85 for knowledge regarding mindfulness, which indicated that they were reliable tools.

Data collection process (Field Work)

The total time for data collection was 4 months starting from the end of May 2020 to the end of August 2020. The researchers met with two different groups of patients every week at each clinic (outpatient clinics and nuclear medicine clinic). Each group took 9 weeks to collect the required data. Data were collected throughout the following three phases:

Phase I: Initial assessment

Each patient was interviewed individually in private rooms in the previously mentioned settings to collect data at baseline (pre-test) and after program implementation (post-test),

Phase II: Implementation phase

During this phase, patients were divided into a total of 20 small groups (8 patients/session). Each group received the same mindfulness and self-efficacy program using the same teaching strategies and handout. Each group underwent a session every 3 weeks, with each session lasting 30–45 min for each group. Description of the program using discussion, demonstration, and re-demonstration were also conducted during each session.

The program implementation consisted of two processes and components. The first involved one theoretical session using material related to knowledge, mindfulness, breathing meditation practice, and self-efficacy exercises. The theoretical session involved two groups of patients (n=16) given that there was enough place to introduce and explain the session for a large number of patients. The second involves one training session involving practice of meditation, self-efficacy, and homework assignment repetition. The patients were instructed to practice this exercise for 20–30 min 6 days a week.

Theoretical session

The theme of the session was an overview on lung cancer disease and an introduction to mindfulness and self-efficacy exercises. The session began with an explanation of the structure and purposes of the educational program. In addition, the definition of lung cancer and its causes, signs and symptoms, treatment, and possible side effect were discussed. This session illustrated the benefits of mindfulness that focused on differentiating physical sensation from thoughts, as well as the benefits and types of self-efficacy exercises.

Training session

The theme of the session was focusing on teaching patients how to use mindfulness techniques, such as body scans, three-minute mindfulness exercises, mindful breathing, and self-efficacy exercises that involved pursed-lip breathing exercises, diaphragmatic breathing, and deep breathing and coughing exercises.

a- Body scan technique

The patient was instructed to take a comfortable seat with a straight back. During a typical body scan, each part of the body is included in this technique, paying close attention to how each area feels. Typically, the scan proceeds systematically up and down the body, beginning at the feet. The patient was told to pay attention to any feelings, ideas, or sensations related to each region of his or her body. Moreover, breathe deeply for a few moments. - Inhale through the nose, count to three. - Exhale three times, twice, once through the mouth. (Silence) - Pay attention to the floor and how the person's feet feel as they touch it. How heavy or light was it. Each area of his or her body could be cold, warm, and so on throughout each part of his/her body. If the patient did not notice anything at all, just observe without judgment.

B. Three -Minutes Mindfulness

- First minute: (Awareness): The researchers instructed the patient to become aware of his/her body. Any physical sensations should be noted without having to alter what is being noted. Now become attentive of his/ her feelings. Remain aware of person's feeling at the time. The patient starts to become aware of his ideas.
- Second minute: (Focus on the breath): The patient was instructed to focus on breathing. Feel the whole of in- and out-breath for about a minute. Feel breathing in the lower part of the body, if possible. He / she should focus on his/ her breathing as a stable place to rest his/her attention.
- Third minute: the patient was instructed to feel every sensation in his or her body with love and curiosity if possible. The researchers then asked them to focus their attention once more on the patient's entire body. Give every feeling room to simply "be there".

C. Mindfulness breathing

The researcher asked the patient to sit comfortably with his/her back straight brings more attention to his body. Eyes was closed, and the patient should gently direct his focus to the natural rhythm of his breath in the chest and

belly. The patient was told to merely pay attention to each inhalation and exhalation. Since breathing in and out causes air to move from the chest through the person's mouth and nose, respectively. The researchers continued to notice patient's breathing while being kind and tolerant. The only thing the researchers could ca do was watching how he breathe. Just be aware of it and bring patient's focus to breathing pattern and the rise and fall of the chest and belly.

Home assignments

Each patient was asked to practice the following exercises at home: 3-min breathing space, attention to breathing, awareness of pleasant events, attention to routine activities, deep breathing exercise, diaphragmatic breathing, and deep breathing and coughing exercises.

During the sessions, the patients were instructed to perform the exercises as best they could and relax their bodies, close their eyes, and focus their attention on their breathing. If distracted, they were told to focus their attention back to breathing. The researchers provided a summary at the end of each session to highlight the most relevant points discussed while also motivating the patient to perform these activities using direct and indirect statements that promote confidence in performing the activity. Researchers provided follow-up and support via telephone. A colored booklet written in Arabic with illustrative figures was introduced to each patient to remind them to exercise and motivate them to practice.

Phase III: Evaluation phase

Post-test data were collected 9 weeks from beginning of intervention using the previous tools to evaluate the effect of the mindfulness-based training program and perceived self-efficacy after the implementation of the program.

Pilot study

A pilot study was conducted on 16 patients to test the applicability and clarity of these tools, as well as the time needed to conduct them. Those included in pilot study were excluded from the study sample and replaced by others to complete the calculated sample.

Statistical design

Data were examined using the Statistical Package for the Social Sciences (SPSS) version 22. Data were presented as numbers and percentages and means and standard deviations. The t-test, Chi-square test, and Pearson's correlation coefficient were utilized for comparisons between pre- and posttest data. $P < 0.05$ indicated statistical significance.

Ethical considerations

Ethical approval was obtained from the Faculty of Nursing at Menoufia University after providing an explanation regarding the purpose of the study (**Research N. 727**, Code of Ethics). The nature and aim of the study were explained according to subjects' level of understanding. They were assured regarding the confidentiality of all gathered data.

Results

Table 1 shows that studied sample had a mean age of 49.50 ± 6.653 years, among whom 60% were male, 45% completed secondary education, and 27.5% were retired, 60% were married, 72.5% were living in rural area, and 45% had insufficient income.

Table 2 illustrates that the mean time since lung cancer diagnosis was 2.33 ± 1.188 years, with 70% having limited stage, 60% having received chemotherapy for lung cancer treatment, and only 35% having a family history of lung cancer.

Table 3 displays that the total mean and SD scores for physical symptoms was 5.65 ± 1.33 and 3.00 ± 1.36 before and after the program, whereas the mean presence of psychological symptoms was 1.90 ± 0.665 and 0.77 ± 0.76 before compared with after the program, respectively.

Table 4 emphasizes a strong statistically significant modification in the performance status of the studied sample after the program application compared to before program application (p value = 0.000).

Table 5 reveals that the total PRAISE self-efficacy level and its subitems improved after program application, with a strong statistically significant difference having been observed in most of studied patients ($P < 0.001$).

Table 6 shows significant changes in total and five-facet mindfulness domains scores after program application ($P < 0.001$).

Table 7 and Figure 1 confirm that the total knowledge score improved considerably after program application, with an extremely strong statistically significant alteration compared to the initial score using Chi-square test and t-test.

Table 8 demonstrates a significant change in total score of breathing meditation practice

after program application (P < 0.001).

Tables 4–8 and Figure 1 confirmed the hypothesis proposed in the introduction, which stated that a mindfulness-based program and perceived self-efficacy for lung cancer would improve patients' knowledge, self-efficacy, mindfulness, and breathing meditation.

Table 9 reveals a statistically significant positive correlation between change in breathing meditation and mindfulness. Moreover, a significant positive correlation between change in self-efficacy, mind fullness, and breathing meditation scores were observed (P = 0.000).

Table 1. Distribution of demographic characteristics of the studied sample (N = 160)

Demographic data	The studied sample (N = 160)	
	N	%
Age: Mean ± SD	49.50±6.653	
Gender:		
Male	96	60
Female	64	40
Educational level		
Illiterate	8	5
Primary level	60	37.5
Secondary level	72	45
University level	20	12.5
Occupation		
Employed full time	28	17.5
Part-time	48	30
Retired	44	27.5
Unemployed/others	40	25
Marital Status:		
Single	16	10
Married	96	60
Divorced	28	17.5
Widow	20	12.5
Living Area:		
Urban	44	27.5
Rural	116	72.5
Household income:		
Enough	60	37.5
Not enough	72	45
Enough and safe	28	17.5

Table 2. Distribution of the studied sample according to medical history characteristics (N = 160)

Medical History Characteristics	The studied sample (N = 160)	
	N	%
• **Stage of lung cancer**		
Limited stage	112	70
Extensive stage	48	30
• **Time since diagnosis in years**: **Mean ± SD**	2.33±1.188	
• **Lung cancer treatments received**		
Chemotherapy	96	60
Radiation	40	25
Chemo-radiation	24	15
• **Smoking**		
Current smoker	4	2.5
Passive smoker	68	42.5
Previous smoker	52	32.5
Non-smoker	36	22.5
• **Family History for cancer**		
Yes	56	35
No	104	65

Table 3. Distribution of the studied sample according to presence of physical and psychological symptoms (N = 160)

Presences of Physical symptoms	**Pre program**		**Post program**	
	No.	%	No.	%
Pain	92	57.5	48	30
Shortness of breath	112	70	44	27.5
Lack of appetite	88	55	56	35
Nausea	60	37.5	40	25
weight loss	76	47.5	56	35
Constipation	32	20	16	10
Difficulty sleeping	104	65	36	22.5
Lack of energy	88	55	28	17.5
Dry mouth	92	57.5	80	50
Feeling drowsy	100	62.5	52	32.5
Difficulty concentrating	60	37.5	24	15
Total Mean ± SD	5.65±1.33(6)		3.00±1.36(6)	
T test and Significance **16.47 (0.000)**				
Presence of Psychological Symptoms				
Worry	96	60	40	25
Feeling nervous	88	55	24	15
Feeling sad	120	75	60	37.5
Total Mean ± SD	1.90±.665(2)		**.77**±.76(3)	
T test and Significance **14.48 (0.000)**				

Table 4. Distribution of the studied sample according to their performance status (patient self-reported ECOG score) (N = 160)

Performance status	The studied sample (N = 160)			
	Pre program		**Post program**	
	N	%	N	%
Performance status				
Fully active	4	2.5	4	2.5
Limited in physically strenuous activity	28	17.5	64	40
Ambulatory and capable of all self-care	56	35	64	40
Capable of only limited self-care	68	42.5	24	15
Disabled completely	4	2.5	4	2.5
Total performance status				
Good	32	20%	68	42.5%
Poor	128	80%	92	57.5%
Total Mean ± SD	**1.75±.83(4)**		**2.25±.86(4)**	
T test and significance	**5.87 (0.000)**			

*Significant (P<0.05)

Table 5. Mean difference and standard deviation of the PRAISE Self-Efficacy Index adapted for respiratory rehabilitation subitems among the studied sample before and after applying the mindfulness-based program (N = 160)

PRAISE Self-efficacy	**The studied sample**					
	Pre		**Post**			
	Mean ± SD	**range**	**Mean ± SD**	**range**	**T test**	**P value**
Factor 1: Overall Self- Efficacy	9.40±2.08	6	15.70±2.94	12	19.121	0.000
Factor2: Individual's belief about their own capacities	2.97±.93	4	4.70±1.29	4	13.36	0.000
Factor 3: accomplishment Performance	4.05±1.12	4	6.37±1.35	6	15.41	0.000
Factor4: Coping as either a trait or a strategy	3.95±.95	3	6.55±1.64	6	17.80	0.000
Total PRAISE Self-efficacy	20.37±2.93	11	33.32±5.11	24	26.14	0.000

*Significant (P < 0.05)

Table 6. Mean difference and standard deviation of the Five-Facet Mindfulness subitems among the studied sample before and after applying the program (N = 160)

Five-Facet Mindfulness	The studied sample				T test	P value
	Pre		Post			
	Mean ± SD	range	Mean ± SD	range		
Observation	4.30±1.05	5	5.75±1.85	6	7.013	0.000
Description	3.55±.74	2	5.62±1.68	6	13.84	0.000
Aware actions	3.57±.97	3	6.27±1.72	6	16.39	0.000
Non-judgmental experience	3.72±.92	3	6.17±1.70	6	17.41	0.000
Non-reactivity	3.47±.86	3	5.90±1.72	6	13.89	0.000
Total mindfulness score	18.62±2.32	8	29.72±4.06	18	28.57	0.000

*Significant (P< 0.05)

Table 7. Mean difference and total knowledge scores among the studied sample before and after the mindfulness-based program and perceived self-efficacy for lung cancer patients (N = 160)

Total knowledge scores	Population sample pre and post applying program				χ^2	P
	Pre-applying		Post-applying			
	N	%	N	%		
Levels of total knowledge						
Poor	100	100	4	2.5		
Average	----	---	124	77.5	**2.094**	**0.000**
Good	----	---	32	20		
Mean knowledge scores before program implementation						
Range Mean ± SD	7 1.65±2.36					
Mean change in total knowledge scores after program implementation						
Range Mean ± SD	9 13.17±2.004					
Paired **T test** **P** (Sig)	44.42 (0.000)					
% of knowledge improvement after program	44 % - 328%					
Mean ± SD	.694 ±.186					

*Significant (P < 0.05)

Figure (1): Total knowledge level pre and post mindfulness-based program and perceived self-efficacy among lung cancer patients

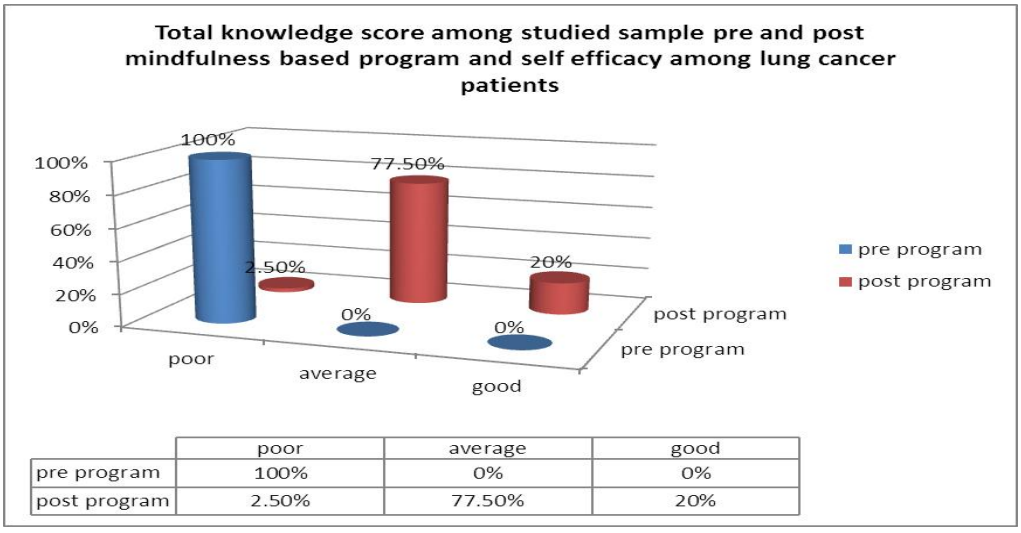

Table 8. Mean difference in total breathing meditation practice scores among the studied population before and after the program (N = 160)

Breathing meditation	The studied sample				T test	P value
	Pre		Post			
	Mean ± SD	range	Mean ± SD	range		
Levels of total breathing meditation	1.17±1.64	6	5.70±1.60	8	26.89	0.000

*Significant (P < 0.05)

Table 9. Correlation between changes in knowledge, mindfulness, breathing meditation, self-efficacy, and symptoms after applying the program (N = 160)

Change in scores for total knowledge, mindfulness, breathing meditation, self -efficacy, and symptoms	Change in scores for total knowledge, mindfulness, breathing meditation, self-efficacy, and symptoms							
	Knowledge		Mindfulness		Breathing meditation		Self-efficacy	
	r	p	r	P	r	p	r	p
Knowledge	------	----	-----	----	----	-----	-----	----
Mindfulness	.002	.980	----	-----	-----	----	-----	----
Breathing meditation	.038	.631	.229	0.00	-----	------	-----	-----
Self-efficacy	.100	.208	.204	0.01	.312	0.00	-----	-----
Symptoms	.052	.511	0.088	.267	.047	.558	.019	. 812

Discussion

Mindfulness has been increasingly used in several aspects of cancer treatment. Reimbursements of mindfulness practices in the management of the adverse effects of treatment and symptoms from cancer progression have been found to be cost **(Mehta et al., 2019).** Self-efficacy is the ability to cope with stress experienced by cancer patients. Patients with high self-efficacy will find it easier to cope with their lives and will have less negative psychological effects **(Chirico et al., 2017).** Among the included patients, three-fifths were males. This is in concordance with a study by **Tian et al., (2015)** carried out at China entitled "Relationships between patient knowledge, psychological status, daily nutrient intake, performance status and the severity of side effects in lung cancer patients," wherein slightly more than three-fifths of the studied subjects were males.

Three-fifths of studied patients were married, whereas a minority was single. A study in the United States conducted by **Lehto et al., (2015)** entitled "Randomized feasibility trial about home-based mindfulness therapy for lung cancer symptom management" found relatively the same results. Moreover, a study by **El-Turk et al., (2021)** at a cancer therapy center in Sydney, Australia entitled "Treatment burden experienced by patients with lung cancer" concluded that more than three-quarters of lung cancer patients were married.

The present study revealed that the majority had limited lung cancer stage. This is consistent with a study by **Shiyko et al., (2019)** carried out in the United States entitled "Intra-individual study of mindfulness: ecological momentary viewpoint in post-surgical lung cancer patients," which emphasized that more than one half of the patients had stage I lung cancer. Meanwhile, a study in the Netherlands by **Van den Hurk et al., (2015)** entitled studied "Mindfulness-based stress reduction for lung cancer patients and their partners" emphasized that most of the patients presented with advanced lung cancer .

In the current study, three-fifths of the studied patients received chemotherapy for lung cancer treatment. This contradicted the results of **Milbury et al., (2020)** in a study at United States entitled "A mindfulness-based intervention as a supportive care stratagem for patients with metastatic non-small cell lung cancer and their spouses," which suggested that a minority of the patients received chemotherapy, whereas the majority received radiation therapy.

Nearly one half of this study subjects were passive smokers, and more than one-third were previous and current smokers. Similarly, a study carried out at New York by **Avancini et al., (2020)** entitled "Physical activity and exercise in lung cancer care" and another research in the United States by **Cho et al., (2021)** entitled "Relations among psychological symptoms, spirituality, and mindfulness, between advanced lung cancer patients and their spousal caregivers"

discovered that more than one half of lung cancer patients were exposed to cigarette smoking. This suggested a relative risk in individuals who had never smoked but lived with a smoker and that passive smoking during childhood increased lung cancer risk in adulthood **(Al-Naggar 2012).**

Our findings clearly showed that there were considerable enhancements in all physical and psychological symptoms mean scores after mindfulness-based program implementation and perceived self-efficacy, which was consisted with the findings of **Zargar et al., (2021)** in Iran entitled "Effect of mindfulness-based stress decline program on quality of life, symptom severity and psychological symptoms, in patients with somatic symptom disorder." Moreover, **Avancini et al., (2020)** confirmed that a mindfulness-based program can significantly reduce the percentage of physical and psychological symptoms. In addition, self-efficacy exercises, such as breathing techniques, had positive effects on physical symptoms in lung cancer patients.

From the researchers' point of view, there were significant improvements in psychological symptom mean scores after program implementation, which may have been related to the fact that mindfulness focuses on relaxing the body, noticing breathing and body sensations, and deep breathing exercises, which could reduce stress and induce psychological relaxation.

Similarly, a study in the United States by **Black et al., (2015)** entitled "Mindfulness meditation and development in daytime impairment and sleep quality amongst older adults with sleep disturbances" observed a main impact on the psychological wellbeing of patients and that mindfulness was effective in reducing depressive and psychological symptoms in lung cancer patients. Moreover, self-efficacy may play an important role in decreasing the effect of psychological symptoms as reported by **Peddireddy, (2019).**

Concerning performance status of the studied subjects, only one-fifth of the participants had good performance status before program application, whereas nearly half of them had good performance status after program application. A study in Malaysia by **Bangash et al., (2017)** entitled "Prognosis in Advanced Non-Small Cell Lung Cancer" supported this result. Moreover, in a study in China entitled "Efficiency and safety of concurrent chemoradiotherapy in ECOG 2 patients with locally progressive non-small-cell lung cancer" conducted by **Bi et al., (2020)** demonstrated that nearly one-third of lung cancer patients had an ECOG score of 2.

In contrast with the current results, two recent studies by **Milbury et al., (2020)** and **Cho et al., (2021)** noted that majority of lung cancer patients had good performance status before the mindfulness program. Also, the current study showed a statistically significant difference in ECOG performance status in before and after program application. This is consistent with a study by **Sivakumar & Susila, (2021)** in India entitled "Effectiveness of Self-care Trials on Self-efficacy, performance status and knowledge among Cancer Patients," which concluded that educational program regarding self-efficacy had a substantial effect on improving cancer patient's performance status.

In light of this, a study entitled "Pulmonary rehabilitation and physical activity in patients with chronic obstructive pulmonary disease" in Brazil by **Spruit et al., (2015)** demonstrated that directly measuring physical activity and performance of problematic daily activities enhanced after breathing exercises and educational sessions promoting self-efficacy compared to baseline. From our point of view, this improvement was a result of program application .

PRAISES self-efficacy level and subitems had improved after program application, with a strong statistically significant difference. This is consistent with the study by **Liacos et al., (2019)** in Australia entitled "Rehabilitation in Pulmonary as Adapted Index of Self-Efficacy (PRAISE) tool predicts in people with chronic obstructive pulmonary disease reduction in sedentary time following pulmonary rehabilitation," which showed a significant improvement in PRAISE score, including exercise performance and health status, after self -efficacy training.

Another recent study in Indonesia carried out by **Gultom, (2020)** entitled "Training Self-Efficacy Improved the Quality of Life in Undertaking Chemotherapy for Cancer Patients ",observed a strong and significant improvement in self-efficacy after self-efficacy

training. **Saetan et al., (2020)**, in a study conducted at the oncology clinic of Ramathibodi Hospital entitled "Effects of the Respiratory Rehabilitation Program on Dyspnea and Perceived Self-Efficacy in Patients with Lung Cancer," established that the mean perceived self-efficacy scores showed a statistically significant difference after practicing pursed-lip, deep breathing, and diaphragmatic exercises .

In the current study, a significant change in five-facet mindfulness score was observed after program implementation. This was consistent with a study by **Chui et al., (2021)** in Malaysia entitled "The Effects practice for five-minute on perceived stress and mindfulness among cancer patients," which declared that the intervention group reported a significant improvement in the level of five-facet mindfulness after mindfulness-based program.

The current study showed an obvious significant change in breathing meditation total score after program implementation. This was consistent with the study by **Shiyko et al., (2019)** who conveyed that only three members informed having some experience with breathing meditation before program. In this regard, **Chui et al., (2021)** mentioned that there was a significant difference in breathing meditation after mindfulness-based program .

Milbury et al., (2020) highlighted the importance of knowledge and meeting the specific needs of mindfulness training for lung cancer patients. In the current study, total knowledge scores improved considerably after program application considering that no patient had good knowledge regarding mindfulness before program application. This result reflects the positive effects of program implementation on lung cancer patients' knowledge. In a study at a Brazilian Public General Hospital entitled "Self-compassion, Quality of life, and mindfulness in cancer patients undergoing chemotherapy," **Garcia et al., (2021)** agreed and mentioned that participants had good knowledge regarding mindfulness after program implementation .

The results of the current study support the hypothesis that patients with lung cancer who received a mindfulness-based program and perceived self-efficacy would show improvements in knowledge, mindfulness, breathing meditation, and self-efficacy.

Conclusion

The present study concluded that implementation of mindfulness-based program and perceived self-efficacy have positive effects on improving physical and psychological symptoms, breathing meditation practice, performance status, and knowledge among patients with lung cancer ($p < 0.001$).

Recommendations

Based on the findings presented herein, the following recommendations are proposed: mindfulness-based program should focus on increasing motivational and self-efficacy based respiratory exercises prescriptions; the same study can be done with large sample size to improve the generalizability of the results. Additionally, we recommend implementing the same program at different time points to improve patient status using brochures and handouts.

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