Do a health educational booklet and telephone follow-up sessions about long-term oxygen therapy influence Patients' health-related outcomes?

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ABSTRACT

Long-term oxygen therapy is the cornerstone of treatment for patients with end-stage chronic obstructive pulmonary disease and chronic respiratory failure. Patients must adhere to it to improve respiratory function as well as health status. **Aim:** To determine the influence of a health educational booklet and telephone follow-up sessions about long-term oxygen therapy influence on patients' health-related outcomes. **Research design:** One group pre-and post-test. **Setting:** Chest Diseases Department and Outpatient Chest Clinic within the Main Assuit University Hospital. **Subject:** Thirty patients with COPD received LTOT. **Tool one:** A structured interviews sheet with COPD patients. **Tool two:** Health Status assessment questionnaire involved two parts: the first section, the Saint George's Respiratory Questionnaire for COPD Patients (SGRQ-C), and the second section**,** the Modified Medical Research Council Dyspnoea Scale (MMRC). **Results:** After receiving a health educational booklet and subsequent telephone follow-up sessions at 3 and 6 months, there was a noteworthy enhancement in arterial blood gas values and all components of the Saint George's Respiratory and Dyspnea scores, displaying statistical significance (p-value = 0.001**). **Conclusion:** The health educational booklet and telephone follow-up sessions regarding LTOT usage led to enhancements in patients' health-related outcomes, a reduced frequency of hospital admissions, alleviated dyspnea, improved arterial blood gas and spirometry values, and enhanced overall health status. **Recommendations:** A health educational booklet and subsequent telephone follow-up sessions are recommended to be an integral part of and relevant to patients' education to uncover patients' attitudes toward clinical practice procedures.

Keywords: A Health Educational Booklet, Long-term oxygen therapy, Patients' health - related outcomes, Sessions & Telephone follow-up.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a condition marked by the gradual narrowing of airways resulting from exposure to harmful particles or gases, primarily from smoking, and is irreversible **(Global Initiative for Chronic Obstructive Lung Disease, 2024).** Severe cases often involve chronic respiratory failure, necessitating long-term oxygen therapy (LTOT), which enhances respiratory function, physical endurance, and cardiac output lowers hospitalization rates for exacerbations, and decreases mortality **(Marcondes et al., 2020).**

Continuous oxygen administration to patients with chronic hypoxemia to maintain appropriate oxygen levels is known as long-term oxygen therapy (LTOT). For individuals who are severely hypoxemic at rest, LTOT entails using oxygen for a minimum of 15 hours daily. Severe hypoxemia is defined by meeting either of the following criteria: 1) PaO2≤55 mmHg or oxygen saturation measured by pulse oximetry (SpO2) ≤88%, with or without hypercapnia; or 2) PaO2=56–59 mmHg or SpO2=89% in combination with peripheral edema, polycythemia (hematocrit ≥55%), or cor-pulmonale **(Hardinge et al., 2015).**

Patient adherence to LTOT is known as the degree to which patients follow their clinician's or other healthcare provider's treatment recommendations. The effective management of chronic illnesses depends on patient compliance **(Aremu et al., 2022)**. Patients must comprehend health information relevant to their illness or disease to enhance adherence to LTOT. This knowledge might be crucial in assisting patients in developing the motivation, decisions, and suitable health behaviors required to enhance overall adherence behaviors **(Thummak et al., 2023)**.

The application of telecommunication technology within nursing practice to deliver and improve patient care is commonly referred to as "tele-nursing." Various communication tools such as computers, televisions, radios, smartphones, and telephones are utilized in tele-nursing interventions **(Tariq et al., 2017).** Given the widespread accessibility of telephone technology, telephone follow-up has emerged as a recognized care intervention in tele-nursing **(Souza-Junior et al., 2016).**

COPD health outcomes for patients are a crucial indicator of their wellbeing and a predictor of other outcomes, such mortality, hospitalizations, and readmissions across a

spectrum of diseases. A lower health status was linked to a higher chance of unfavorable COPD outcomes in patients, such as mortality and COPD exacerbations **(GOLD, 2024).**

Significance of the study

Patients with COPD represent the most prevalent uniform cohort experiencing arterial hypoxemia, comprising 67.8–81.6% of all patients requiring Long-Term Oxygen Therapy (LTOT) **(Mesquita et al., 2018).** Education about LTOT enables patients to better manage their symptoms. Understanding when and how to use oxygen therapy effectively can alleviate respiratory distress, improve breathing, and enhance overall comfort and quality of life. Moreover, regular telephone follow-ups serve as reminders and support mechanisms for patients, encouraging adherence to LTOT prescriptions and treatment plans. This consistent communication helps reinforce the importance of compliance, thereby reducing the likelihood of treatment interruptions or misuse. Engaging patients through educational materials and regular follow-up can also lead to notable improvements in their health status. This may include enhanced lung function, better arterial blood gas values, reduced dyspnoea, and an overall better quality of life. Thus, this study was carried out to examine the influence of a health educational booklet and telephone follow-up sessions regarding LTOT usage on enhancements in patients' health-related outcomes.

Aim of the study

The present study aimed to determine the influence of the health educational booklet and telephone follow up sessions about long-term oxygen therapy on patients' health-related outcomes.

Research Hypotheses

The research hypotheses for the current study were as follows:

- H0: There is no effect of a health educational booklet and telephone follow-up sessions on patients' health-related outcomes about long-term oxygen therapy.
- H1: A health educational booklet and telephone follow-up sessions positively impact patients' disease-related outcomes related to long-term oxygen therapy.

SUBJECTS AND METHOD

The study's subjects and methodology were outlined through four primary designs, delineated as follows:

1. Technical design.
2. Operational design.
3. Administrative design.
4. Statistical design.

1. Technical design: The technical design included research design, research setting, subjects and data collection tools.

Research design:

To conduct this study, a quasi-experimental design was used for one group (pretest, posttest and follow up). To assess changes over time in this type of quasi-experiment, the researcher administered both pre- and post-tests **(Richardson, 2018).**

Research setting:

The research was conducted within the Chest Diseases Department of Assiut University Hospital, as well as an Outpatient Chest Clinic.

Subjects:

The study subjects were selected through purposive sampling; the patients studied met the standard eligibility criteria for the prescription of LTOT (30 patients). The inclusion criteria consisted of the following: (a) All patients diagnosed with COPD (post-bronchodilator FEV1/FVC < 70%), aged between 20 and 75 years; (b) willingness to participate; (c) sufficient consciousness and orientation to respond to questions; (d) absence of hearing or vision impairments; (e) absence of cognitive disorders; (f) possession of a personal mobile phone and proficiency in its use; (g) no changes in treatment regimen in the past 4 weeks; (h) absence of other respiratory disorders.

Sampling technique: A purposive sample was used to include the COPD patients according to their participation in the study.

Sample size determination was conducted using G Power software, resulting in a sample size of 30 cases for testing differences between two independent means in a two-tailed analysis. Parameters included a power level of 95%, an effect size of 0.8, and a margin of error of 0.05.

Data collection tools: In this study, two tools were utilized.

Tool one: A structured interviews sheet with COPD patients; was employed in this study. The questionnaire design was informed by a review of literature **(Mesquita et al., 2018; Yang et al., 2019; Touni et al., 2024; and Sundhet al., 2018).** It was divided into two primary sections to evaluate the following:

The first section: Sociodemographic characteristics of the study patient: The researchers designed a section to gather demographic information from the study participants. This section comprises six items focusing on personal characteristics. Namely, age, sex, marital status, place of residence, level of education, and employment status.

The second section: Patient's Medical History and Clinical Assessment Data (baseline and follow up assessment): The researchers designed this section to evaluate the medical background and current health condition of the participants. It encompassed nine elements, including the patient's height and weight for determining the body mass index (BMI) category: normal (18.5-24.9), overweight (25-29.9), and obese (30-34.9). **(National Heart, Lung, and Blood Institute, 2022).** Smoking status (current or past), number of pack\days, duration of disease, medication for COPD (long-acting bronchodilators, inhaled corticosteroid-containing medications, combination of LABAs and corticosteroid, and combination of LABAs, LAMA, and corticosteroids), arterial blood gas measurement and forced spirometer values (FEV1, FVC, and FEV1/FVC), hospital admission due to exacerbation, and the daily duration of LTOT (numbers of hours/day).

Tool two: Health Status assessment questionnaire (Pre/post-test): This tool included 2 parts:

Part 1: The Saint George's Respiratory Questionnaire for COPD Patients (SGRQ-C) is a disease-specific instrument designed to evaluate the impact of obstructive

airway conditions on various aspects of health, daily functioning, and subjective well-being **(Meguro et al., 2007).** It consists of three main components: symptoms, which measure the distress associated with respiratory symptoms; activity, which assesses the interference with daily activities; and impact, which evaluates psychosocial functioning. These components are combined to derive a total score indicating the overall health status.

Scoring technique: The questionnaire yielded both a comprehensive score and three individual component scores (symptoms, activity, and impacts). Each component was assessed independently, with the weights assigned to all positively responded items being totalled. The overall score was derived by summing the weights of all positively responded items across each component.

The maximum potential weights for each component and the total are as follows:

- Symptoms: 566.2
- Activity: 982.9
- Impacts: 1652.8
- Total (sum of maximum for all three components): 3201.9

Please note that these values represent the highest achievable weights corresponding to the worst possible state of the patient.

Part 2: Modified Medical Research Council Dyspnea Scale (mMRC):

A modified Medical Research Council Dyspnea Scale was utilized to assess breathlessness in daily activities. It involved five grades (0–4) representing varying levels of dyspnea during physiological tasks, ranging from none (0) to severe dyspnea (4). The descriptions include: 0, absence of breathlessness except during vigorous exercise; 1, experiencing breathlessness when walking quickly on flat ground or uphill; 2, walking slower than peers of the same age due to breathlessness or needing to pause for breath while walking at their own pace on flat ground; 3, stopping for breath after walking approximately 100 yards or for a few minutes on flat ground; and 4, being too breathless to leave the house or experiencing breathlessness while dressing or undressing **(Nishiyama et al., 2010).**

2. Operational design: The operational design encompassed several stages, including the preparatory phase, face and content validity, reliability assessment, pilot study, and fieldwork.

(a)The Preparatory Phase: Finding relevant and recent literature on the study topic, numerous studies, and information on many aspects of the problem involves accessing all official websites, including PubMed, Google Scholar, academic books, papers, and journals. There was also a review of related theoretical knowledge.

(b) Face and content validity: A jury of five professors with expertise in Medical-surgical nursing, Gerontological nursing, and Chest diseases from the faculties of nursing and medicine at Assiut University. Who assessed and revised various aspects including content coverage, clarity, relevance, applicability, wording, length, format, and overall presentation of the tools. Modifications, including rephrasing and rearranging certain sentences, were made based on the feedback and suggestions provided by the experts.

(c) Reliability: It was done using alpha "Cronbach's alpha test" to assess the internal consistency of the tool and its value was tool I (0.871), tool II, Part I: (0.94) for SGRQ-C and tool II, Part 2: (0.94) for mMRC which means all tools were reliable.

(d) Pilot Study: It took place prior to data collection on 10% of the total study's subjects to evaluate the first and second tool while omitting them from the research's total sample. The pilot study aimed to determine the applicability, clarity, and time required for completion of the study tool. It also helped to identify issues and barriers that might hinder the collection of data. Based on the findings of the pilot research, certain adjustments to the tool were made.

(e) Field work: The phases of assessment, planning, implementation, and evaluation were used to complete this fieldwork.

- **Assessment phase (pre-test/post-test phase):** During the assessment phase, which spanned from March 2023 to the end of 2024, the researcher initiated the study by selecting participants according to predetermined criteria and collecting baseline

data. Researchers were present at a designated location three days a week, conducting interviews with an average of two to three patients per day. Patients who fulfilled the inclusion criteria were scheduled for meetings on the same day that they were scheduled for telephone follow-up sessions and to receive health education booklet after obtaining approval to proceed. Researchers introduced themselves, obtained consent, conducted interviews, completed questionnaire sheets, and explained the study's purpose, ensuring participants of confidentiality regarding the collected information.

- **Planning phase:**

The researcher began to develop a health educational booklet and telephone follow up sessions based on the information collected at the first assessment, in addition to literature; it was developed under the guidance of supervisors.

Construction of the health educational booklet and telephone follow-up sessions: It was constructed in simple Arabic, using clear and concise words. Sentences are short and simple, as they are easier to read and understand. Ambiguous titles were also avoided, where each title included a clear description of the page's subject.

- **Implementation Phase:** The education process was carried out in two phases, as follows:

Phase I: Education with the booklet:

- The researchers conducted interviews with patients at the chest diseases department who had been prearranged. They introduced themselves, clarified the study's objectives, and invited the patients to participate.
- The patients received face-to-face education with a health education booklet while hospitalized. The researchers created and structured the content of the booklet in PowerPoint slides, delivered during a single session divided into two segments: a theoretical section and a practical section. Each educational session lasted 30–45 minutes, aligning with the objectives outlined in the education plan. Patient engagement and inquiries were actively encouraged and facilitated during the sessions. Key points were emphasized for ease of retention.
- The researchers employed diverse teaching techniques including brainstorming, demonstration, and re-demonstration of the LTOT procedure. Additionally, patients received a video via WhatsApp to complement the education booklet, enhancing the

learning experience with visuals. Uniform sessions were conducted for all patients, lasting approximately three to six months. Following each session, 5–10 minutes were allocated for discussion and feedback.

Session	Time	Content
1st session	15-20 Minutes 15-25 Minutes	• Greeting and orientation with patient • Introduction about Long term oxygen therapy and COPD. • Discuss how to perform the LTOT procedure correctly, how to care for and revise the expiration date of the oxygen mask, and how to adjust the number of LTOT hours
2nd session	15-20 Minutes 15-25 Minutes	• Discuss how to care for and revise the expiration date of the oxygen mask, and how to adjust the number of LTOT hours. • Discuss what you would do if an alarm sounded. Such as switching off and ringing the engineer as needed, checking for a pipe or filter blockage.
3rd session	15-20 Minutes	▪ Identify the importance of follow-up for patients' adaptation to LTOT, possible problems with the LTOT equipment as mask problems, and the best way to contact patients with their caregiver and health care provider.

Phase II: telephone follow-up sessions. One telephone education session was held every two weeks after hospital discharge, with maximum call duration of 15 to 20 minutes. The telephone education and follow-up sessions were carried out over six weeks. The patient was questioned regarding the use of medications and the LTOT follow-up, and their queries and concerns were addressed. It was conducted at the patient's preferred time, between 8 a.m. and 8 p.m. In addition, patients were encouraged to adhere to the health education booklet. During these phone consultations, the researcher conducted individualized telephone consultations with the patient, asking them to discuss any potential obstacles to adherence or other factors that could lead to poor

disease control. The researcher also inquired about the patient's willingness to change their behaviour and collaborated with them to decide on a shared health education booklet and telephone follow-up sessions to enhance adherence and disease control.

- **Evaluation phase:** It aimed to evaluate the effectiveness of a health educational booklet and telephone follow up sessions on hospital admission due to exacerbation, arterial blood gas measurement and force spirometer values, dyspnea, and overall health status. Patients were assessed twice: first after three months and then again after six months from the initiation of long-term oxygen therapy at the chest outpatient clinic of Assiut University Hospital. This evaluation aimed to re-evaluate the patients' health-related outcomes using tool I (second section), and tool II (part1, & 2), to determine any changes between the pre- and post-delivery of the health educational booklet and telephone follow-up sessions.

Ethical considerations

The research proposal received approval from the ethical committee in the Faculty of Nursing at Assiut University (2/2023). The study posed no risk to the participants. It adhered to standard ethical principles in clinical research. Before participation, informed consent was obtained from willing patients after thoroughly explaining the study's nature and objectives. Measures were in place to ensure confidentiality and anonymity of the participants. Participants had the right to decline participation or withdraw from the study at any time without providing a reason. Patient privacy was carefully maintained during data collection.

Statistical design

The Statistical Package for Social Sciences (SPSS) V.26 facilitated data organization, categorization, coding, tabulation, and analysis. Data were presented using numbers, percentages, means, and standard deviations, illustrated through tables and charts. Cochran's test assessed differences before and after intervention and follow-up, while Pearson correlation measured variable relationships. T-tests, ANOVA tests, and McNemar tests were employed to compare variable means. A significance level of $p < 0.05$ indicated statistical significance.

RESULTS

Table 1 shows a comprehensive overview of the personal characteristics of the studied patients. Regarding age distribution, it was found that the mean± SD age was 56.77± 10.99. As regards gender distribution, the sample is predominantly composed of male patients (70%). Concerning marital status, most patients are married (80%). As regards residence, slightly more than half reside in rural areas (53.3%). As regards educational level, more than half of patients have at least a secondary school education or higher (56.7%). Finally, regarding occupational status, the largest occupational group is the "not work" category (36.6%).

Table 2 represents the distribution of medical data for thirty patients, presumably with COPD. The BMI categories are represented, with nearly one-third of patients falling into overweight" (26.7%) and "obese class I" (20.0%). Approximately 36.7% of the patients are smokers. Among the smokers, 26.7% smoke fewer than 3 packs a day. The duration of COPD varies, with the majority (76.7%) having COPD for 10 years or more.

Figure 1 displays the distribution of the considered patients according to their treatment**.** It can be noticed that more than half (53.3%) of COPD patients use a combination of LABAs and corticosteroids, compared to 30% of the studied patients' combination of LABAs, LAMAs, and corticosteroids.

Table 3 demonstrate distribution of the studied patients according to daily duration of LTOT in pre- and post-health education, there was a significant difference statistically (p-value = 0.001**). It displayed a highly improvement in the daily adherence of LTOT mean± SD of (p-value = 0.004**).

Table 4 displays a reduction in hospital readmissions post-test than pre-test (p-value = 0.001**).

Table 5 illustrates a statistically significant improvement in arterial blood gas measurements in the post-a health educational booklet and telephone follow-up sessions compared to pre-health education about long-term oxygen therapy (p-value = 0.001**, 0.023**, and 0.001**, respectively). As regards the results of the Force Spirometer Values, it displayed a highly significant improvement in the mean of FEV1, FVC, and FEV1/FVC% (I\ min) (p-value = 0.001**, 0.001**, and 0.008**), respectively.

Table 6 summarizes a highly statistically significant difference in all parts of ST. George's respiratory scores before and after 3 and 6 months of a health educational booklet and telephone follow-up sessions. It displays a highly significant improvement in the scores for all items of respiratory symptoms and activities (p-value = 0.001).

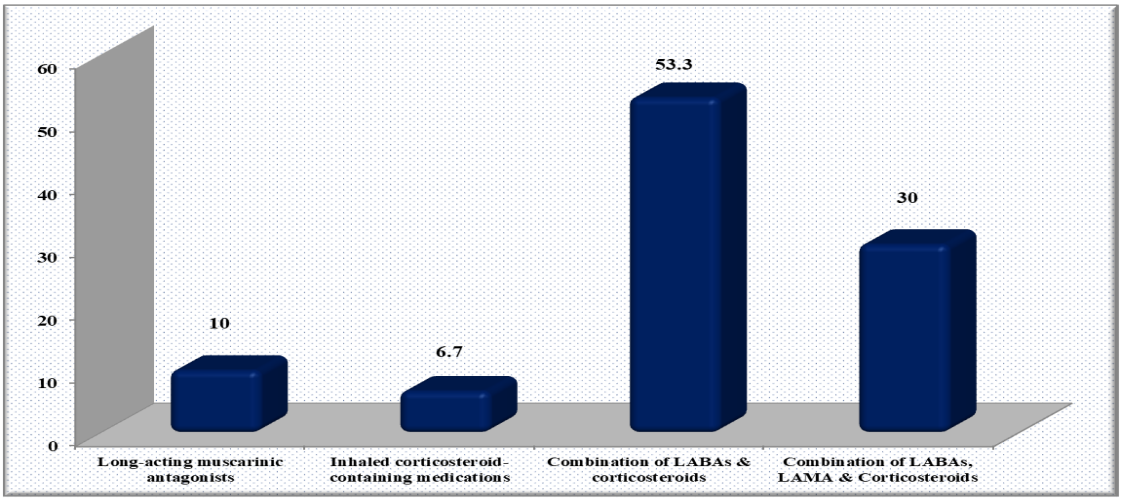
Table 7 displays how the grade of dyspnea changes over time, specifically before a health educational booklet and telephone follow up sessions, after 3 months, and after 6 months. There is a highly statistically significant difference in dyspnea grade over the health education period, P-value (0.001^{**}).

= 30)

Variables	N.	%
Age group / years		
- <50 years	8	26.7
- ≥50 years	22	73.3
Age (mean± SD)	**56.77± 10.99**	
Sex:		
- Male	21	70.0
- Female	9	30.0
Marital Status:		
- Single	1	3.3
- Married	24	80.0
- Divorced	1	3.3
- Widow	4	13.4
Place of residence:		
- Urban	14	46.7
- Rural	16	53.3
Level of education:		
- Illiterate	4	13.3
- Primary school	9	30.0
- Secondary school	12	40.0
- University & higher education	5	16.7
Employment status:		
- Employer	8	26.7
- Housewife	6	20.0
- Not work	11	36.6
- Retired	5	16.7

Table (2): Medical data and anthropometric characteristics of patients (**n = 30)**

Medical data	N.	%
Weight /kg (Mean± SD)	**78.57±20.02**	
Height/ cm (Mean± SD)	**159.57±17.5**	
Body mass index (BMI):		
- Below 18.5	2	6.7
- 18.5 – 24.9	8	26.7
- 25.0 – 29.9	8	26.7
- 30.0 – 34.9	6	20.0
- 35.0 – 39.9	4	13.3
- More than 40	2	6.7
Smoking:		
- Yes	11	36.7
- No	19	63.3
Number of pack/ days:		
- **< 3**	8	26.7
- **≥ 3**	3	10.0
Duration of COPD:		
- <10 years	7	23.3
- ≥10 years	23	76.7
Duration of COPD (mean ±SD)	**10.00±3.85**	



Long-Acting Beta Agonists (LABAs).
Long-acting muscarinic antagonists (LAMA).
Figure (1) COPD treatment groups among studied patients (n=30).

Table (3): Daily duration of long-term oxygen therapy pre and post a health educational booklet and telephone follow up intervention (n=30)

Items	Pre intervention		Post intervention		P-value
	N	%	N	%	
LTOT adherence					
• Yes	7	23.3	27	90.0	**0.001****
• No	23	76.7	3	10.0	
Daily duration of LTOT (Mean±SD)	11.50± 2.502		15.98±4.304		**0.004****

McNemar test

LTOT: Long-term oxygen therapy

(**) Highly statistically significant difference

Table (4): Hospital admission due to exacerbation pre and post a health educational booklet and telephone follow up sessions (n=30)

Hospital admission due to exacerbation	Pre intervention		Post intervention		P-value
	N	%	N	%	
• Yes	27	90.0	9	30.0	
• No	3	10.0	21	70.0	**0.001****

(**) Highly statistically significant difference

Table (5): Mean ±SD of arterial blood gas measurement and Force Spirometer Values pre and post a health educational booklet and telephone follow up intervention (n=30)

Items	Mean ±SD		P-value
	Pre intervention	Post intervention (6 months)	
Arterial blood gas measurement			
PaO2 mmHg	49.24±15.68	76.49±20.43	**0.001****
PaCO2 mmHg	59.67±27.45	48.67±10.54	**0.023***
SpO2 %	65.87±15.39	91.90±3.64	**0.001****
Force spirometer values			
FEV1	29.27±10.123	47.43±15.31	**0.001****
FVC	49.37±15.62	67.77±17.21	**0.001****
FEV1/FVC ratio%	58.77±14.59	69.80±13.67	**0.008****

T- Test. (*) statistical significant difference/(**) Highly statistically significant difference

Pao2 (Partial Pressure of Oxygen), Paco2 (Partial Pressure of Carbon Dioxide), Spo2 (Oxygen Saturation), FEV1 (Forced Expiratory Volume in 1 second) and FVC (Forced Vital Capacity).

Table (6): Mean ±SD ST. George's Respiratory scores pre and post a health educational booklet and telephone follow up sessions (n=30)

Items	Mean ±SD			P-value
	Baseline (Before)	After 3 months	After 6 months	
Respiratory Symptoms	522.38±49.74	364.08±37.21	288.01±52.35	**0.001****
Activity and impact	2608.49±50.51	1536.10±314.28	832.47±291.37	**0.001****
Total	**3130.87±81.05**	**1900.18±317.06**	**1120.47±290.43**	**0.001****

Anova test. (*) statistical significant difference. (**) Highly statistically significant difference

Table (7): Dyspnoea Grades pre and post a health educational booklet and telephone follow-up intervention sessions (n=30)

Grade of dyspnea	Before		After 3 moths		After 6 months		P- value
	N	%	N	%	N	%	
• Dyspnoea level I	0	0.0	0	0.0	2	6.7	**0.001****
• Dyspnoea level II	0	0.0	8	26.7	13	43.3	
• Dyspnoea level III	3	10.0	8	26.7	9	30.0	
• Dyspnoea level IV	13	43.3	9	30.0	5	16.7	
• Dyspnoea level V	14	46.7	5	16.6	1	3.3	

Chochrane test. (**) Highly statistically significant difference

DISCUSSION

The primary aim of long-term oxygen therapy for COPD patients is to provide supplementary oxygen to ensure adequate organ function, potentially increasing survival rates and reducing hospital admissions. A health educational booklet and telephone follow-up sessions about LTOT contribute to enhance patients' health and prevent disease exacerbations **(Sundh et al., 2018).**

Regarding the personal characteristics of the studied population, most patients are aged fifty years or older, predominantly male, and married. This mirrors the findings of **Touni et al. (2024),** who investigated treatment compliance among adults with chronic obstructive pulmonary disease at Menia Chest Hospital and found that over half of the sample fell within the 51–60 age range. These demographic trends may be attributed to age-related changes in the respiratory system, which can predispose individuals to lung diseases like COPD, exacerbated by prolonged exposure to environmental pollutants.

In terms of education level, more than half of the patients in the study have completed secondary school or higher, aligning with the findings of **Labieb et al. (2020),** who noted a similar trend with nearly more than one-third of their study participants having education up to primary and secondary school levels. This observation suggests a potential for increased health awareness regarding treatment compliance and COPD management.

Regarding residence, over half of the sampled individuals reside in rural areas, consistent with Ibrahim and Abd **El-Maksoud's (2018)** findings, where a majority of

their study subjects also lived in rural settings. A related study in China by **Fang et al. (2018)** similarly noted a significantly higher prevalence of COPD in rural areas compared to urban areas, attributed to poorer healthcare quality, and increased exposure to chest infection-inducing factors like chemicals from construction and farming activities, as well as smoke from burning agricultural waste. Another Egyptian study by **Badway et al. (2016)** also found a higher likelihood of COPD in rural populations compared to urban areas.

Regarding occupation, the largest occupational category is "not working." This finding is supported by **Patel et al. (2018),** who observed a considerable loss in productivity among COPD patients, potentially exacerbated by the need for oxygen therapy for a minimum of 15 hours daily. Reduced lung function associated with COPD can hinder patients' ability to carry out daily tasks, further impacting their productivity.

As per the current study, most patients had a smoking history of over ten years, with over one-third having previously smoked. These findings are consistent with those of **Gomaa et al. (2020),** who similarly observed that most patients in their study had smoked for over a decade. Additionally, **Mehany et al. (2016)** found that more than one-third of their study participants had smoked cigarettes for over ten years, with the majority also experiencing illness for a similar duration. Globally, smoking is considered the most prevalent risk factor for COPD.

In developed countries, smoking is estimated to be responsible for approximately 73 percent of COPD-related mortality, while in developing nations, this figure is around 40 percent. One significant risk factor for COPD in developing regions is indoor air pollution resulting from the use of biomass fuels for heating and cooking in poorly ventilated spaces. Women are often exposed to biomass smoke during household activities, with over 3 billion people globally facing such exposure **Woldeamanuel et al. (2019).** Smoking, when combined with long-term oxygen therapy, can create potentially life-threatening situations. Therefore, quitting smoking is essential for successful long-term oxygen treatment.

BMI classifications reveal that approximately one-third of patients are categorized as "overweight" and twenty percent as "obese class I," aligning with the findings of **Mohsen et al. (2019),** which suggest that COPD progression may lead to obesity or

muscle mass loss. Moreover, more than half of COPD patients in this study had a median BMI indicating overweight or obesity, consistent with findings from **Salama et al. (2016)**, who found most overweight COPD patients in an Egyptian study. Similarly, **Al Karn et al. (2018)** noted BMIs of 23 or higher in both groups in another Egyptian study. While most COPD patients may be overweight, the loss of lean body mass is increasingly recognized as a significant comorbidity of the disease.

A significant proportion of patients (90.0%) experienced hospital admissions due to COPD exacerbations, consistent with the findings of **Saliem et al. (2022),** who noted that most patients in their study had three or more hospital admissions. Similarly, **Bafadhel et al. (2020)** reported common occurrences of re-admissions and hospitalizations among COPD patients, emphasizing their substantial impact on disease prognosis, progression, and mortality. These patterns reflect the chronic nature of the disease and the frequent acute exacerbations that may culminate in respiratory failure.

The findings of the current study indicate that the average duration of long-term oxygen therapy is approximately 11.50 hours per day. This duration falls short of the recommended usage of at least 15 hours per day, preferably 24 hours per day, as suggested by **Sundh et al. (2018).** These recommendations are supported by studies conducted in the 1970s by the Medical Research Council (MRC) and the Nocturnal Oxygen Therapy Trial (NOTT). LTOT prescriptions are primarily issued upon hospital discharge following remission of lung disease or exacerbation. For patients with severe COPD and resting hypoxemia, LTOT is a crucial component of treatment, extending their lifespan. To monitor daily usage, a time counter synchronized with the concentrator's functionality is affixed to the device.

In the treatment patterns observed, it was noted that around one-third of the patients in the study utilized a combination of long-acting beta-agonists (LABAs), long-acting muscarinic antagonists (LAMAs), and corticosteroids. Additionally, more than half of COPD patients employ a combination of LABAs and corticosteroids. Common treatment combinations for COPD include inhaled corticosteroid (ICS) plus LABA, as well as short-acting anticholinergic plus short-acting beta-agonist (SABA). While triple combination therapy with ICS, LABAs, and LAMAs is recommended for the most severe COPD cases, it's notable that many patients prescribed this combination may have only mild or moderate disease severity **(Cazzola et al., 2018).**

The results of arterial blood gas analysis before and after health education booklet and telephone follow up sessions about long-term oxygen therapy revealed a statistically significant improvement in PaO2 levels and a decrease in PaCO2 levels, along with a highly significant improvement in SaO2%. These findings are consistent with those of **Mehany et al. (2016),** who observed significant improvements in arterial blood gas parameters following long-term oxygen treatment, including increased PaO2 values and decreased PaCO2 values. Similarly, **Mesquita et al. (2018)** found that patients adhering to LTOT demonstrated higher SaO2 values and lower PaCO2 values compared to non-adherent patients. Regarding force spirometer values, significant improvements were observed in mean FEV1, FVC, and FEV1/FVC%. These findings are in line with **Abdelghany et al. (2018)**, who reported no significant changes in these spirometric parameters among patients undergoing pulmonary function test follow-up. Due to the high cost of spirometry tests, they were conducted only twice in this study.

The present study revealed a highly significant difference in all components of ST. George's Respiratory Questionnaire (SGRQ) scores before, after 3 months, and after 6 months of health education booklet and telephone follow-up sessions. This finding aligns with the results of **Mesquita et al. (2018),** who observed improved SGRQ scores with adherence to Long-Term Oxygen Therapy, indicating its effectiveness in alleviating COPD symptoms. Moreover, our study suggests that adhering to LTOT for a year can enhance the quality of life by relieving symptoms. Similarly, **Raghunath et al. (2023)** demonstrated that patients with COPD experienced notable improvements in their symptoms, activity levels, and overall SGRQ scores three months after initiating long-term oxygen therapy, with sustained improvements in symptoms and activity scores observed at twelve months.

According to studies by **Labieb et al. (2020) and Çetinkaya et al. (2014)**, oxygen treatment has been observed to reduce dyspnea scores in COPD patients, as indicated by the mMRC dyspnea grade. This reduction in dyspnea is attributed to the alleviation of breathing effort and the prevention of anxiety and distress associated with long-term oxygen therapy, especially when used for at least 15 hours daily. These studies noted a statistically significant decrease in dyspnea scores among LTOT patients during follow-up visits compared to baseline. However, **Raghunath et al. (2023)** reported that while overall health-related quality of life (HRQoL) improved with LTOT, there was no significant improvement in mMRC dyspnea grade after 12 months compared to baseline.

This lack of improvement may be attributed to the progressive nature of the disease, leading to a gradual decline in lung function.

In prior research, it has been emphasized that adherence to therapeutic routines is crucial for patients with chronic obstructive pulmonary disease who are undergoing long-term oxygen therapy. Health education materials like booklets and follow-up calls have been found to have positive impacts on such patients, fostering a collaborative approach to managing their conditions. These interventions are particularly significant in post-hospitalization rehabilitation. Recent studies in Iran on tele-nursing have highlighted that while patient education through booklets is beneficial, it alone may not suffice to enhance treatment adherence. Therefore, there is a pressing need to introduce post-discharge follow-up methods to improve patient outcomes (**Fronczek et al., 2017).**

CONCLUSION

Our findings suggest that providing health education booklets and conducting telephone follow-up sessions about the use of long-term oxygen therapy can have positive outcomes. These interventions can enhance patient adherence to LTOT, improve arterial blood gas analysis and spirometer values, alleviate dyspnea, decrease hospital readmissions, and enhance overall health status. Consequently, our results underscore the importance of ongoing care through health education booklet and telephone follow-up sessions for such patients.

RECOMMENDATIONS

The following recommendations were reached considering the results of this study:

- A health educational booklet and subsequent telephone follow-up sessions about appropriate LTOT use have been suggested as important strategies for patient adherence improvement and health outcomes, as well as improving arterial blood gas analysis and force spirometry values, reducing dyspnea, hospital readmissions, and improving health status.
- Telephone follow-up sessions post-hospital discharge offers a straightforward and practical intervention that allows for personalized delivery of information and support during a potentially stressful period for patients. This approach could assess the

effectiveness of long-term oxygen therapy and improve its efficacy in individuals with chronic obstructive pulmonary disease.

- Health educational booklet and telephone follow-up sessions are recommended to be an integral part of and relevant to patients' education to uncover patients' attitudes toward clinical practice procedures.
- A health educational booklet and telephone follow-up sessions should be replicated on larger study populations for generalization of the results.
- Ensuring ongoing educational programs concerning therapeutic regimens for patients with COPD is a significant concern within the chest diseases department and outpatient chest clinics.

Disclosure of potential conflicts of interest

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References

Abdelghany, M. F., Elkady, S. M., Elkarn, A. F., & Aly, M. G. (2018): Clinical outcome of 1-year long-term oxygen therapy in patients with chronic obstructive pulmonary disease. *The Egyptian Journal of Chest Diseases and Tuberculosis*, *67*(3), 208-213.

Karn, A. F. A., Hassan, W. A., Fadl, A. A. A. E., & Mahmoud, M. A. (2018): Effectiveness of pulmonary rehabilitation on pulmonary function parameters and dyspnea in patients with stable chronic obstructive pulmonary disease. *Egyptian Journal of Bronchology*, *12*(2), 149-153.

Aremu, T. O., Oluwole, O. E., Adeyinka, K. O., & Schommer, J. C. (2022): Medication adherence and compliance: recipe for improving patient outcomes. *Pharmacy*, *10*(5), 106.

Badway, M. S., Hamed, A. F., & Yousef, F. M. (2016): Prevalence of chronic obstructive pulmonary disease (COPD) in Qena Governorate. *Egyptian Journal of Chest Diseases and Tuberculosis*, *65*(1), 29-34.

Bafadhel, M., Criner, G., Dransfield, M. T., Janssens, W., McDonald, V. M., Vogelmeier, C. F., ... & Collis, P. (2020): Exacerbations of chronic obstructive pulmonary disease: time to rename. *The Lancet Respiratory Medicine*, *8*(2), 133-135.

Cazzola, M., Rogliani, P., Calzetta, L., & Matera, M. G. (2018): Triple therapy versus single and dual long-acting bronchodilator therapy in COPD: a systematic review and meta-analysis. *European Respiratory Journal*, *52*(6), 1-11.

Çetinkaya, P. D., Özkan, S. A., Erer, O. F., Halil, H., & Yalniz, E. (2014): The Efficacy of Long Term Oxygen Therapy in COPD. *Turk Toraks Dergisi*, *15*(1), 9.

Fang, L., Gao, P., Bao, H., Tang, X., Wang, B., Feng, Y., ... & Wang, L.

(2018): Chronic obstructive pulmonary disease in China: a nationwide prevalence study. *The Lancet Respiratory Medicine*, *6*(6), 421-430.

Fronczek, A. E., Rouhana, N. A., & Kitchin, J. M. (2017): Enhancing telehealth education in nursing: Applying King's conceptual framework and theory of goal attainment. *Nursing Science Quarterly*, *30*(3), 209-213.

Global Initiative for Chronic Lung Disease GOLD (2024): Global Strategy for the Diagnosis, Management and Prevention of COPD. GOLD website. http://www.goldcopd.org.

Gomaa, W. S., Mohamed, H. A., & Morad, A. H. (2020): Assessment lifestyle for patients with chronic obstructive pulmonary disease. *Egyptian Journal of Health Care*, *11*(2), 273-285.

Hardinge, M., Annandale, J., Bourne, S., Cooper, B., Evans, A., Freeman, D.,… & British Thoracic Society Standards of Care Committee. (2015). British Thoracic Society guidelines for home oxygen use in adults: accredited by NICE. *Thorax*, *70*(Suppl. 1), i1-i43.

Ibrahim, R. A., & Abd El-Maksoud, M. M. (2018): Effect of educational programs on knowledge and self-management of patients with chronic obstructive pulmonary disease. *Egyptian Nursing Journal*, *15*(3), 246-257.

Labieb, M., Mohamed, S., El-Aziz, A., Nermeen, M., Hassan, A., & Fahmy, H. (2020): Impact of Implementing Nursing Protocol on Respiratory Function of Elderly Patients' with Chronic Obstructive Pulmonary Disease. *Assiut Scientific Nursing Journal*, *8*(20.00), 38-52.

Marcondes V., Kuwazuru T., Silva L., Cezare T., Franco E., Prudente R ., & Tanni S., (2020): Evaluation of the association of adherence to long-term home oxygen therapy and clinical markers and five-year mortality in patients with chronic obstructive pulmonary disease J Bras Pneumol. 46(6):e20190158.

Meguro, M., Barley, E. A., Spencer, S., & Jones, P. W. (2007): Development and Validation of an Improved, COPD-Specific Version of the St. George Respiratory Questionnaire. Chest, 132(2), 456–463. https://doi.org/10.1378/chest.06-0702.

Mehany M., Abd Elaal E., Ghanem M, & Tolba K., (2016): Effect of Specific Nursing Intervention on Respiratory Status of COPD during Acute Exacerbation. IOSR Journal of Nursing and Health Science, 5(2), 77-84.

Mesquita, C. B., Knaut, C., Caram, L. M. O., Ferrari, R., Bazan, S. G. Z., Godoy, I., & Tanni, S. E. (2018): Impact of adherence to long-term oxygen therapy on patients with COPD and exertional hypoxemia followed for one year. Jornal brasileiro de pneumologia: publicacao oficial da Sociedade Brasileira de Pneumologia e Tisilogia, 44(5), 390–397. https://doi.org/10.1590/S1806-37562017000000019.

Mohsen S., Hanafy F., Fathy A., & El‑Gilany A., (2019): Non adherence to treatment and quality of life among patients with chronic obstructive pulmonary disease, Lung India 36(3):193-198.

National Heart, Lung and blood Institute, (2022): Available at: https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm.

Nishiyama, O., Taniguchi, H., Kondoh, Y., Kimura, T., Kato, K., Kataoka, K., & Arizono, S. (2010): A simple assessment of dyspnoea as a prognostic indicator in idiopathic pulmonary fibrosis. *European Respiratory Journal*, *36*(5), 1067-1072.

Patel, J. G., Coutinho, A. D., Lunacsek, O. E., & Dalal, A. A. (2018): COPD affects worker productivity and health care costs. *International Journal of Chronic Obstructive Pulmonary Disease, 13(2018),* 2301–2311. https://doi.org/10.2147/COPD.S163795

Raghunath P., Anandan T., & Mohamed S., (2023): Effect of Long-Term Oxygen Therapy in Chronic Obstructive Pulmonary Disease: A Prospective Clinical Study. Journal of Clinical & Diagnostic Research, 17(3), 5-8.

Richardson, J. T. (2018): The use of Latin-square designs in educational and psychological research. *Educational Research Review, 24 (June 2018),* 84-97.

Salama S., Hussein A., Khalil M., & Eid S., (2016): Lean BMIs as markers of malnutrition in chronic obstructive pulmonary disease patients, The Egyptian Journal of Bronchology; 10 (1): 33-37.

Hamad, A. H., Abdelmoniem, A. E., & Saleh, M. D. (2022): Effect of Supportive Nursing Care on Symptoms Severity and Quality of Life for Patients with Chronic Obstructive Pulmonary Disease. *Zagazig Nursing Journal*, *18*(2), 126-145.

Sundh, J., Ahmadi, Z., & Ekström, M. (2018): Daily duration of long-term oxygen therapy and risk of hospitalization in oxygen-dependent COPD patients.

International Journal of Chronic Obstructive Pulmonary Disease, 13(2018), 2623–2628. https://doi.org/10.2147/COPD.S167523

Thummak, S., Uppor, W., & Wannarit, L. O. (2023): Patient compliance: A concept analysis. *Belitung Nursing Journal*, 9(5), 421-427.

Touni M., Ragheb S., Mohammed H., & Ibrahim W. (2024): Compliance toward treatment among Adults with Chronic Obstructive Pulmonary Disease, *Egyptian Journal of Health Care*, 15(1), 305-318.

Woldeamanuel, G. G., Mingude, A. B., & Geta, T. G. (2019): Prevalence of chronic obstructive pulmonary disease (COPD) and its associated factors among adults in Abeshge District, Ethiopia: a cross sectional study. *BMC Pulmonary Medicine*, *19*(181), 1-9.

Yang, H., Wang, H., Du, L., Wang, Y., Wang, X., & Zhang, R. (2019): Disease knowledge and self-management behavior of COPD patients in China. Medicine, 98(8), e14460.

Tariq, A., Westbrook, J., Byrne, M., Robinson, M., & Baysari, M. T. (2017): Applying a human factors approach to improve usability of a decision support system in tele-nursing. Collegian, 24(3), 227-236.

Souza-Junior, V. D., Mendes, I. A. C., Mazzo, A., & Godoy, S. (2016): Application of telenursing in nursing practice: an integrative literature review. Applied nursing research, February 2016; 29, 254-260.

هل يؤثر كتيب التثقيف الصحي وجلسات المتابعة الهاتفية حول العلاج بالأكسجين على المدى الطويل على النتائج المتعلقة بصحة المرضى؟

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الخـــلاصـــــــــــــة

يعتبرالعلاج بالأكسجين على المدى الطويل حجر الزاوية في علاج المرضى الذين يعانون من مرض الانسداد الرئوي المزمن في المرحلة النهائية وكذلك فشل الجهاز التنفسي المزمن. يجب على المرضى الالتزام به لتحسين وظيفة الجهاز التنفسي وكذلك الحالة الصحية. **الهدف:** تحديد تأثير كتيب التثقيف الصحي وجلسات المتابعة الهاتفية حول تأثير العلاج بالأكسجين على المدى الطويل على النتائج المتعلقة بصحة المرضى. **تصميم البحث:** مجموعة واحدة من مرضى الانسداد الرئوى المزمن قبل وبعد الاختبار. **المكان:** قسم الأمراض الصدرية وعيادة الصدر الخارجية داخل مستشفى أسيوط الجامعي الرئيسي. **عينة البحث:** ثلاثون مريضا يخضعون للعلاج بالاكسجين على المدى الطويل. **أدوات البحث:**الأداة الأولى: استمارة مقابلة منظمة مع مرضى الانسداد الرئوي المزمن. الأداة الثانية: استبيان تقييم الحالة الصحية يتألف من جزأين: الجزء الأول ، استبيان سانت جورج التنفسي لمرضى الانسداد الرئوي المزمن (SGRQ-C) ، والجزء الثاني ، مقياس ضيق التنفس التابع لمجلس البحوث الطبية المعدلة (MMRC). **النتائج:** كان هناك تحسن ملحوظ في قيم غازات الدم الشرياني وجميع مكونات درجات سانت جورج التنفسية وضيق التنفس ، مما يدل على دلالة إحصائية (القيمة p = 0.001 **). **الخلاصة:** أدى كتيب التثقيف الصحي وجلسات المتابعة الهاتفية المتعلقة باستخدام العلاج بالأكسجين على المدى الطويل إلى تحسينات في النتائج المتعلقة بصحة المرضى ، وتقليل عدد مرات دخول المستشفى ، وتخفيف ضيق التنفس ، وتحسين قيم غازات الدم الشرياني وقياس التنفس ، وتعزيز الحالة الصحية العامة. **التوصيات:** يوصى باستخدام كتيب التثقيف الصحي وجلسات المتابعة الهاتفية لتكون جزءا لا يتجزأ من تثقيف المرضى.

الكلمات المرشدة: كتيب تثقيفي صحي ، العلاج بالأكسجين على المدى الطويل ، النتائج المتعلقة بصحة المرضى ، الجلسات والمتابعة الهاتفية.