Original Article

Long-term oxygen therapy prescription in India: Evaluation of compliance, factors affecting compliance, indications, and survival

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ABSTRACT

Introduction: The international data shows that long-term oxygen therapy (LTOT) compliance is insufficient and variable. We conducted the first study from India on LTOT compliance, factors affecting compliance, indications, and survival through oxygen concentrator. **Materials and Methods:** Our organization from Delhi had given 378 oxygen concentrators over the last 5 years. We evaluated 120 patients randomly for participating in the study. Compliance was defined as the use of LTOT for at least 15 h/day. **Results:** Ninety-seven patients were included in the final analysis after exclusion criteria. The compliance to LTOT was seen in 45.36% (44/97). The commonest cause of noncompliance was lack of instructions (49.06%) followed by electricity issues, social stigma, and workplace constraints. A higher $PaCO_2$ was associated with significantly lower compliance ($PaCO_2$ 53.18 vs. 44.98 mmHg, $P = 0.036$). Interstitial lung disease was associated with significantly higher compliance. Oxygen prescription was titrated with arterial blood gas analysis in only 4.12%. The indications for LTOT were chronic obstructive pulmonary disease (49.48%), posttuberculous obstructive airway disease (20.6%), and interstitial lung disease (12.37%). We found a significant reduction in the mean number of exacerbations/year from 3.91 to 1.93 ($P < 0.0001$). 61.86% of the patients were surviving on LTOT with a median survival time of 12 months. **Conclusion:** The adherence to LTOT in Indian patients is suboptimal mainly due to lack of instruction and is associated with a higher $PaCO_2$. The practice of titration needs to be followed. The development of a national registry to monitor LTOT should be the long-term target.

KEY WORDS: Chronic obstructive pulmonary disease, compliance, long term oxygen therapy

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INTRODUCTION

Oxygen therapy is a medication that needs to be properly prescribed. Long-term oxygen therapy (LTOT) is an established treatment to improve the survival of patients with chronic obstructive pulmonary disease (COPD) and chronic severe hypoxemia.[1-3] The recommendations for the use of LTOT in other respiratory and cardiac disease are extrapolated from the evidence in COPD. LTOT is indicated in chronic lung disease when there is a severe hypoxemia with an arterial partial pressure of oxygen (PaO2) of <55 mmHg or <60 mmHg along with the presence of polycythemia (hematocrit >55%), congestive cardiac failure, or pulmonary hypertension in the resting state.[4] The usage of LTOT for 15 h/day is considered to be

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optimum based on the British Medical Research Council trial.[3]

There have been published registries on LTOT from various parts of the world. The compliance to LTOT is often insufficient and varies markedly from 17% to 70% in different studies.[1,5-8] Most of the studies are from resource-rich countries as the United States, Sweden, Switzerland, Denmark, etc. There is a paucity of data regarding LTOT use from resource-limited countries like India where healthcare is not fully insured. Furthermore, there is no national register that can maintain data of such patients. To the best of our knowledge, ours is the first study from India to evaluate LTOT prescription in patients on oxygen concentrator.

LTOT is associated with considerable logistics and cost. When inappropriately used, LTOT might also be an unnecessary burden as being connected to oxygen equipment is associated with social isolation.[9-11] Considering the high socioeconomic burden of LTOT versus the positive impact on patients' health-related quality of life, the compliance with LTOT as per recommendation is very important. Adherence is also used interchangeably with compliance.[12] While prescribing LTOT, the unique socioeconomic features and its implications on treatment should be known to the prescribing physicians. The factors affecting a fine balance of maximizing the benefit and minimizing the discomfort are likely to be different in India compared to other countries. Hence, we conducted this study, first of its kind from India with the primary objective to find out compliance of patients on LTOT through oxygen concentrator. The secondary objectives of our study were to determine the factors affecting compliance to LTOT, to evaluate various indications for LTOT, and to evaluate survival of patients on LTOT.

MATERIALS AND METHODS

This was a retrospective observational study conducted in a tertiary care center after obtaining Institutional ethics committee approval. An informed consent was obtained from all the participants. Employees State Insurance Corporation (ESIC) is one of the few organizations in India, which provides oxygen concentrator to the insured easily and free of cost. The patients of chronic lung diseases who have received LTOT in the form of oxygen concentrator from Delhi ESIC were included in the study. The patient selection for LTOT by ESIC was based on the arterial blood gas (ABG) analysis parameters assessed by the prescribing physician and had to be approved by the dispensary in charge. LTOT is provided from the ESIC when the room air PaO_2 level is <55 mmHg or <60 mmHg with the presence of polycythemia, congestive cardiac failure, or pulmonary hypertension as per the guidelines. The patients who have been given concentrator from all the Delhi ESIC dispensaries are registered at Directorate, Medical, Delhi. There are 32 ESIC dispensaries in Delhi. We acquired the list of patients who were given the oxygen concentrator over the last 5 years. The list was then segregated as per the dispensary. The dispensary in-charges were contacted via their numbers given on ESIC website to get the contact details of the patients from that particular dispensary. The phone numbers were also obtained from the "Dhanwantari" a module, which stores all the data of insured person via the information and technology (IT) portal. The dispensary in-charges and the IT personnel were followed up and persuaded for giving the contact details. Once contact details were obtained, each patient or their relative was contacted telephonically and invited to attend a visit to the hospital.

The details regarding their disease, treatment, compliance to LTOT, factors affecting compliance, and survival status were enquired as per the pro forma [Annexure 1] from the patient or a close relative. The previous medical records were checked to find out baseline diagnosis, presence of comorbidities, ABG analysis, spirometry, and vaccination status if available. Those who could not manage a hospital visit were telephonically interviewed regarding the details. The patients who had used LTOT for <1 month, patient/relative unwilling to share information on the LTOT received from ESIC, and those who could not be contacted after 3 attempts were excluded from the study. Those who came to our hospital during the study period and were on LTOT from outside sources were also included. Figure 1 shows the methodology flow chart of our study. Compliance to LTOT was defined if the patient was using oxygen for at least 15 h/day for ≥80% of days. The failure to adhere to minimum 15 h daily usage was defined as non-compliance. The diagnosis of the primary disease was taken as mentioned in their previous medical records.

Statistical analysis

The data were entered into Microsoft excel sheet. The statistical analysis was done using SPSS software version 16.0 (Chicago, USA). The descriptive statistics for numeric variables were expressed as mean ± standard deviation and categorical variables were expressed as number and percentage. The mean values of the two groups were compared using the Student's *t*-test and the categorical variables were compared using the Chi-square test. The $P < 0.05$ was considered to be statistically significant. The sample size was calculated using the formula: $N = (Z^2 \times P \times (1\text{-}P))/e^2$; where Z = value from standard normal distribution corresponding to desired confidence level (Z = 1.96 for 95% confidence interval), *P* is expected true proportion and e is desired precision.[13] Considering the prevalence of adherence to LTOT as 50% (prior literature shows adherence to LTOT varies from 17% to 70%) and precision of 10%, a minimum sample size of 96 was required. We targeted to include at least 120 patients in our study including the attrition of 20% due to possible inability to acquire full data.

RESULTS

A total of 378 patients were identified who had received oxygen concentrator from ESIC. Out of them, 120 patients were randomly selected to meet our desired sample size. Three patients using LTOT prescribed from outside sources were also included making our total study population of 123. After applying exclusion criteria, 97 patients were included in the final analysis [Figure 1]. Their baseline characteristics are given in Table 1. The patients had a mean age of 58.02 ± 12.41 years. 53.6% of the study population were men and 46.4% were women. We had 5 patients who had continued smoking despite being on LTOT. 29.9% of patients had presence comorbidity along with the terminal respiratory disease. Diabetes and pulmonary hypertension were the most common comorbidities found in 14.43% and 15.46% patients respectively. The echocardiographic data was not available in 62 patients, so the possibility of coexisting pulmonary hypertension in them cannot be ruled out. In our study, only 21.65% of patients were undergoing home-based pulmonary rehabilitation. Others were not practicing mostly due to lack of awareness or being too sick and so had restricted mobility. Oxygen prescription was titrated with ABG in only 4.12% of our patients. All the patients had received LTOT after physician's prescription but none of our patients had home visit by any health care professional for monitoring the oxygen usage. In addition, none had any dedicated full-time person allotted to care for LTOT.

The LTOT usage was analyzed for the total duration of use and daily use in hours [Figure 2]. Most of our patients

Table 1: Baseline patient characteristics

Characteristic (*n*=97)	Prevalence (%)
Age in years (mean±SD)	58.02±12.41
Gender, *n* (%)	
Male	52 (53.6)
Female	45 (46.4)
Smoking status, *n* (%)	
Non smoker	48 (49.48)
Current smoker	5 (5.15)
Former smoker	44 (45.36)
Comorbidities, *n* (%)	
Presence of any comorbidity	29 (29.9)
Diabetes	15 (15.46)
Hypertension	5 (5.15)
Pulmonary hypertension	14 (14.43)
Cardiac disease	5 (5.15)
OSA, depression, shift worker disease	1 (1.03)
Lung cancer	1 (1.03)
Rehabilitation, *n* (%)	21 (21.65)
Vaccination against pneumococcus, *n* (%)	74 (76.29)
Oxygen titration prior to prescription, *n* (%)	4 (4.12)
Home visits by healthcare staff, *n* (%)	Nil
Full-time person allotted for LTOT care, *n* (%)	Nil

LTOT: Long-term oxygen therapy, OSA: Obstructive sleep apnea, SD: Standard deviation

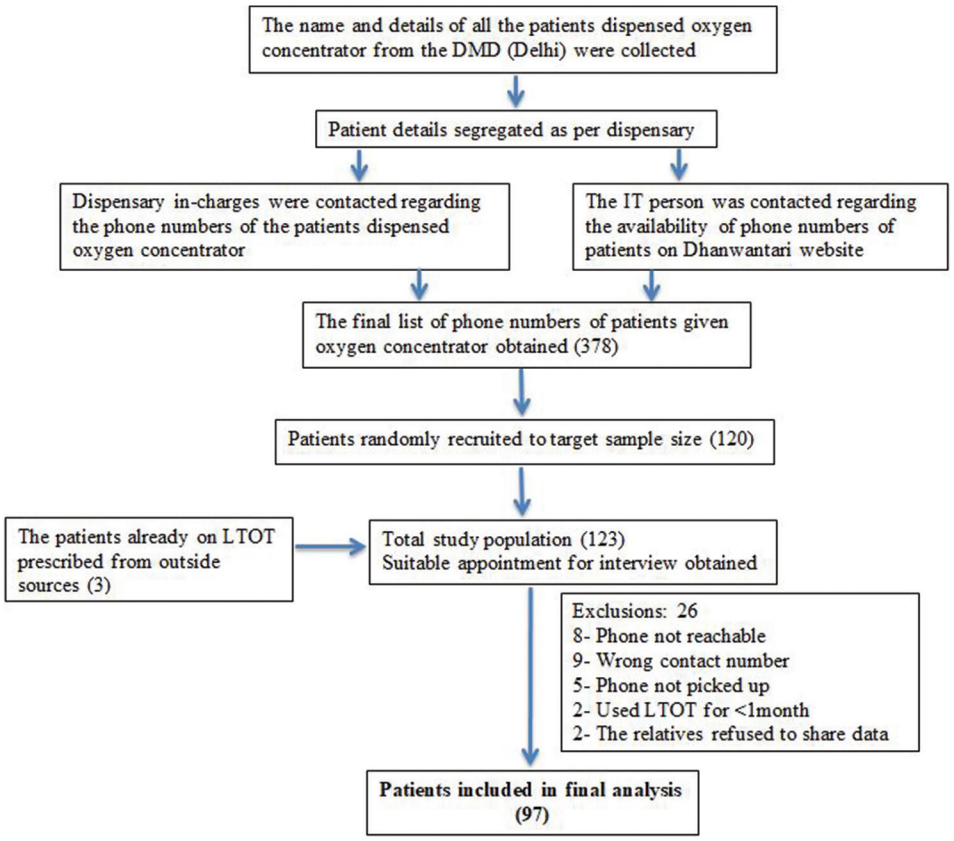

Figure 1: Flow chart showing study methodology of patient inclusion

i.e., 43.3% were using LTOT since the last 6–12 months and 11.34% had been using it for at least 3 years. The average daily usage was >15 h in 45.36% of our patients who were thus compliant to LTOT. 54.64% i.e., more than half of the patients prescribed LTOT were noncompliant. We also observed that a significant number of patients, 21.65% were using for <6 h/day and 2 patients used it intermittently whenever they felt dyspneic. The various reasons for noncompliance to LTOT in our study are shown in Table 2. The most common reason was lack of instructions given by the treating physician during prescription or follow-up found in 49.06% of patients. Others included electricity issues, social stigma, inability to use oxygen at workplace, etc., One patient complained of headache with use of LTOT so she avoided it. 13.21% of patients reported having received physician's advice of using LTOT for <15 h/day and thus they were compliant to the physician's advice. They were advised to use LTOT for 12 h a day or use when dyspneic or when oxygen saturation falls below 90%.

Table 3 shows the difference in various parameters in patients who were compliant compared to noncompliant patients. There was no significant difference in their demographic characteristics, smoking status, and lung functions assessed by spirometry. The total duration of LTOT use also did not affect the compliance. When the ABG values were compared, the mean $PaCO_2$ was significantly higher in noncompliant compared to compliant patients (44.98 vs. 53.18 mmHg, $P = 0.036$). The noncompliant patients also had a significantly higher prevalence of comorbidities (39.62% vs. 18.18%, $P = 0.021$). Among the various indications of LTOT, interstitial lung disease (ILD) patients had significantly higher compliance. There was no significant difference in compliance versus noncompliance for other diseases.

The most common indication for use of LTOT in our patients was obstructive airway disease (OAD). 49.48% of the patients had smoking-associated COPD and 20.6% had post tuberculous OAD. ILD was seen in 12.37% of cases [Figure 3]. One patient on LTOT had chronic kidney disease along with multiple comorbidities in form of, recurrent pleural effusion, pulmonary hypertension, post tuberculosis fibrotic lung disease, anemia, and thalassemia.

The various clinical outcomes were compared before and after the use of LTOT [Table 4]. We found that there was a significant reduction in the mean number of exacerbations/year from 3.91 to 1.93 ($P < 0.0001$). On LTOT, 38.14% of patients had expired at the time of interview whereas 61.85% were alive with the median survival time of 12 months. Among the patients with >1 year LTOT usage 58.69% (27/46) were alive and among those with >3 years usage 54.54% (6/11) were alive. The mortality rate was higher in post tuberculous OAD group (50%) compared to 33.33% each in COPD and ILD. There was no significant difference in mortality among compliant versus noncompliant patients. There were 4.12% patients whose hypoxemia improved and thus did not require LTOT later.

Table 2: Reasons of noncompliance to long term oxygen therapy

Reason for noncompliance	*n*=53, *n* (%)
Lack of instructions	26 (49.06)
Social stigma	8 (15.09)
Physician advised use for <15 h (so compliant as per advice)	7 (13.21)
Electricity issues	7 (13.21)
Lack of power supply	6 (11.32)
Electricity point away from bed	1 (1.87)
Inability to use oxygen at workplace	4 (7.56)
Headache	1 (1.89)

Table 3: Factors affecting the compliance to long term oxygen therapy

Characteristic	Compliant (*n*=44)	Noncompliant (*n*=53)	*P*
Age (mean±SD)	55.79±13.35	59.87±11.37	0.107
Gender (male:female)	27:17	25:28	0.162
Duration of LTOT usage			
Total (months)	20.63±21.35	21.06±20.89	0.920
Daily (h)	17.70±3.25	6.79±3.53	<0.0001
Indication of LTOT			
COPD (48)	20	28	0.469
ILD (12)	10	2	0.004
Posttuberculous OAD (20)	7	13	0.296
Others (19)	7	12	0.405
Smoking status			
Non-smoker (48)	22	26	0.924
Current smoker (5)	3	2	0.499
Former smoker (44)	19	25	0.694
Spirometric parameters* (*n*=25)	*n*=14	*n*=11	
FEV_1 (l)	0.83±0.30	0.68±0.17	0.153
FEV_1 (% predicted)	33.71±15.78	30.73±13.11	0.619
FVC (l)	1.57±0.46	1.51±0.39	0.732
FVC (% predicted)	49.57±14.28	53.36±15.28	0.529
ABG** (*n*=40)	*n*=22	*n*=18	
pH	7.42±0.06	7.40±0.03	0.206
pCO2	44.98±11.02	53.18±12.93	0.036
pO2	50.20±8.55	48.73±8.57	0.592
HCO3	31.34±6.81	34.82±8.49	0.158
Presence of comorbidities, *n* (%)	8 (18.18)	21 (39.62)	0.021
Pulmonary rehabilitation, *n* (%)	9 (20.45)	11 (20.75)	0.974
NIV usage, *n* (%)	5 (11.36)	3 (5.66)	0.309
Vaccination status, *n* (%)	36 (81.82)	38 (71.7)	0.243

*The spirometric data was available only for 25 patients, **The ABG record was available only for 40 patients. SD: Standard deviation, ABG: Arterial blood gas analysis, COPD: Chronic obstructive pulmonary disease, FEV_1: Forced expiratory volume in 1 s, FVC: Forced vital capacity, ILD: Interstitial lung disease, LTOT: Long term oxygen therapy, NIV: Noninvasive ventilation, OAD: Obstructive airway disease

DISCUSSION

The issue of compliance to LTOT has always been of utmost interest. There have been various national registries on LTOT; however, none such is available in India. So the exact estimate of LTOT prescription and related information in India regarding adherence is difficult to predict. Our study found that the compliance with LTOT in India is 45.36%. The earlier studies from other countries have reported the

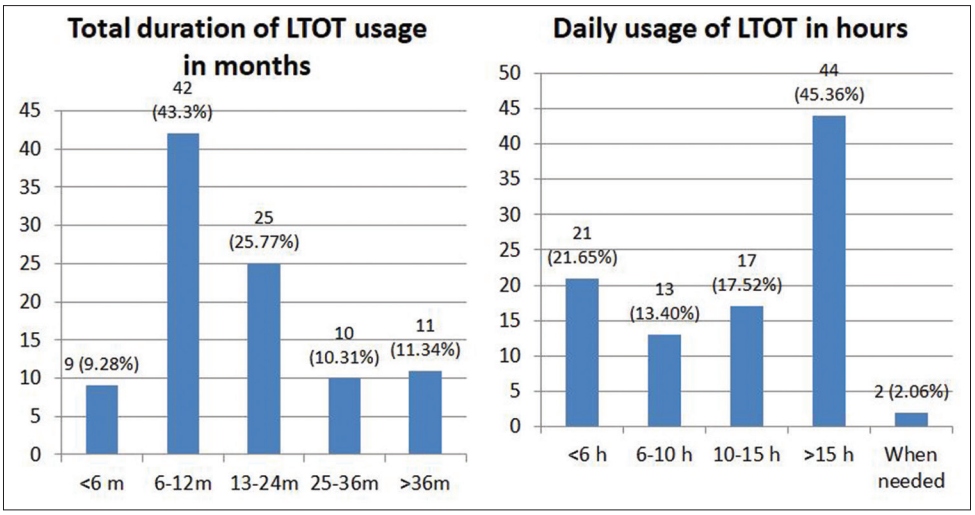

Figure 2: Bar graphs showing total duration long-term oxygen therapy usage and daily duration of long-term oxygen therapy usage

Table 4: Outcome with long term oxygen therapy use

Exacerbation rate/year	Mean ± SD
Prior to LTOT	3.91±3.64
After LTOT	1.93±2.39
P	<0.0001
Survival and mortality data	**Prevalence, *n* (%)**
Total surviving	60/97 (61.85)
Median survival time (months)	12
Survival as per duration of LTOT usage (total number)	
>1 year (46)	27 (58.69)
>2 years (21)	12 (57.14)
>3 years (11)	6 (54.54)
Total expired	37/97 (38.14)
Mortality data as per disease (total number)	
COPD (48)	16 (33.34)
Posttuberculous OAD (20)	10 (50)
ILD (12)	4 (33.34)
Others (17)	7 (41.18)
Mortality as per compliance (total number)	
Compliant (44)	18 (40.90)
Noncompliant (53)	19 (33.96)
P	0.609
NIV requirement	8 (8.24)
Stopped using LTOT as hypoxia improved	4 (4.12)

COPD: Chronic obstructive pulmonary disease, ILD: Interstitial lung disease, LTOT: Long term oxygen therapy, OAD: Obstructive airway disease, SD: Standard deviation, NIV: Noninvasive ventilation

compliance with LTOT varying from 45% to 70%.[14] The Turkish studies have shown a much lower compliance of 25%–31%.[15] There is only one prior study from India on LTOT compliance in COPD patients, the study was limited by the oxygen delivery device used. It showed a very low compliance rate of only 21.4%.[5] 48.3% of patients in their study were using oxygen cylinder whereas all our patients were on oxygen concentrator. Oxygen cylinder use is expected to affect compliance owing to the poor availability of cylinder refilling facilities and the practical difficulty in getting the cylinders frequently filled. Also, in our study, the concentrators were provided free of cost by ESIC. The insurance companies in India do not cover oxygen concentrator. We should make a collective effort to ensure that patients requiring oxygen concentrators are reimbursed from the insurance companies.

We have also evaluated the reasons for non-compliance. The poor compliance in our study was mainly due to result of lack of instructions or wrong instruction from the physicians. Lack of instruction was seen during prescription seen in 49.06% (26/53) of the noncompliant patients. Seven patients, i.e., 13.21% had received incorrect instructions from the physician to use LTOT for 12 h a day or when felt breathless or when SpO2 was <90%. Ideally, the patients receiving LTOT should be advised in detail regarding the daily duration of use, the oxygen flow rate, and the oxygen delivery device to be used at the time of prescription. This should also be assessed at each follow-up visit. The positive health effects of LTOT are observed with the usage of LTOT for at least 15 h a day.[3] Our results are in line with earlier studies. As per the study by Erol *et al*., 47.1% of patients were unaware that usage should be >15 h/day.[15] Katsenos *et al*. reported inadequate prescriptions in 55% patients.[16] The other Indian study reported, only 37.5% had received correct advice from prescribing doctors regarding daily duration of use.[5] The inadequate power supply was another important concern for noncompliance in our study seen in 13.21% patients. One of the patients had the oxygen concentrator charging point away from the bed. Mantoo *et al*. reported 31.25% concentrator users blamed inadequate power supply for poor compliance.[5] Other reasons of noncompliance reported in earlier studies are more or less similar to ours that include fear of getting addicted to oxygen, inability to use oxygen at workplace, device noise, disturbed sleep, lack of need, nasal dryness, and headache.[7,15,17]

One of our patients attributed noncompliance because of the development of headache. This could be related to hypercapnia resulting from a higher than required flow rate of oxygen therapy. A higher baseline PaCO2 was

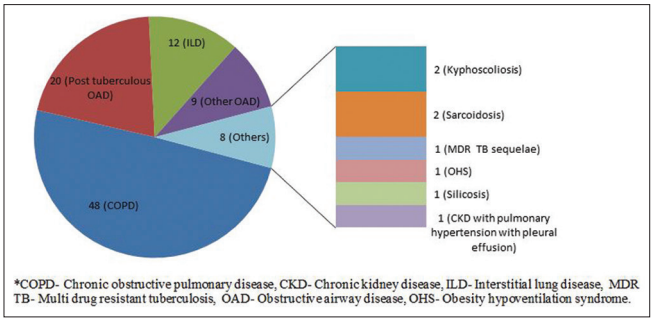

Figure 3: Pie chart showing the various indications of long-term oxygen therapy

indeed associated with poor compliance. Similarly, ILD patients who are less likely to have hypercapnia had a good compliance. Oxygen is a drug and the flow rate like drug dose should be titrated. Our study found only 4.12% of patients had undergone titration with ABG prior to LTOT prescription. The patients requiring LTOT should be titrated with a starting flow rate of 1 L/min. It should then be progressively increased by 0.5–1 L/min every 20 min until SpO_2 is >90%. ABG should be performed after titration is complete to determine if adequate oxygenation (PaO_2 ≥60 mmHg) has been achieved without worsening hypercapnia.[4,18,19] Noninvasive ventilation (NIV) is indicated if there is hypercapnia at the time of prescription or hypercapnia develops at the time of titration. Only 8.24% of patients had received NIV. Possibly, they received NIV due to baseline hypercapnia as titration was performed in only 4.12% of patients. There is lack of study on the association between high $PaCO_2$ and non-compliance to LTOT, however, recent indirect evidence from the HOT-HMV trial supports our results.[20] The patients with chronic respiratory failure with hypercapnia require domiciliary NIV in addition to LTOT.[20,21] LTOT alone in them without proper titration would be disastrous leading to worsening hypercapnia. This would result in side-effects such as headache and rarely respiratory acidosis thereby affecting their compliance. There is a lack of awareness among physicians regarding the need for oxygen titration and its method prior to prescribing LTOT.[22]

Our study revealed that none of our patients received home care service. The presence of well-organized home care programs, family training, and social support is reported to be the predictors of adherence.[23] In most western countries, home care services and dedicated oxygen nurses are available for monitoring at home. However, such facilities are not available in India. We recommend that proper initiatives should be taken by respiratory physicians to make the concentrators available by the insurance companies and home visit facility is made available to patients on LTOT.

The benefits of LTOT have been extended to other chronic pulmonary disorders including ILDs, bronchiectasis, etc., but LTOT is currently not being studied in diseases other than COPD. A significant population of our study had indications other than COPD similar to the study by Erol *et al*.[15] The BTS guideline has the same recommendations for LTOT use in these patients.[4] Although the long-term survival in ILD patients on LTOT is poor compared to COPD, LTOT continues to be used in ILD as it provides symptomatic relief and improved quality of life.[13] In our study 12.37% cases had ILD. Posttuberculous OAD is a significant concern in developing countries like India where the burden of infectious diseases is high. Posttuberculous OAD also frequently complicates to pulmonary hypertension and respiratory failure thus requiring LTOT.[24,25] Our study had 20.6% of LTOT indication as posttuberculous OAD. Hence, overall the burden of long-term complications of tuberculosis is very high in our country. We need to take measures to reduce this burden apart from COPD-related burden.

The clinical outcome parameters in our study matched the earlier results. Our study showed a significant reduction in the exacerbation rate with LTOT from 3.91 to 1.93 per year. Turkoglu *et al*. had found the hospital admission rate/year had decreased from 1.14 ± 1.64 to 0.56 ± 0.79.[7] The median survival time of patients on LTOT in our study was 1 year. This varies from 1.5 to 3 years as per prior reports.[6,26,27] The 1-year survival rate in COPD patients on LTOT ranges from 70 to 82.8% while the 5-year survival rate varies from 19.1 to 41.5%.[28] In our study, at least 58.69% of the patients were surviving for >1 years and 54.54% for >3 years on LTOT. The variable results might be related to the variable periods of follow-up in our study. Some of our patients had recently received LTOT with usage <6 months. In addition, a significant number of our patients had indications other than COPD for LTOT including ILD. This could have resulted in the lower survival in our study. The disease-specific outcomes in our study showed a higher mortality in posttuberculous OAD (50%). This might be related to the fact that posttuberculous OAD patients present with poorer lung functions, frequent exacerbations, and respiratory failure.[24] Posttuberculous OAD in the form of small airway obstruction is known to remain undetected unless there are severe symptoms or >80% of airways are involved.[29] Thus the posttuberculous OAD patients on LTOT are likely to be in severe hypoxemia thereby not having much benefit with LTOT.

We also found that 4.12% of our patients no longer required LTOT. There are similar reports of improvement in hypoxemia after 3 months. This can be seen in about 20%–50% of patients.[30] Thus it is recommended to re-assess the patients on LTOT for further need of LTOT every 3 months.

Our study has some limitations. We have not evaluated the socioeconomic characteristics that can affect compliance and the quality of life with LTOT. Since LTOT was provided easily and free of cost to those insured from ESIC, the socioeconomic impact of LTOT from our study

cannot be extrapolated to non-insured persons. Also, we did not use any specific objective method to determine LTOT adherence, rather relied on history by the patient or relative. This could probably overestimate the actual compliance.

CONCLUSION

The compliance to LTOT in India is poor owing to a lack of instructions during prescription. The LTOT should be used for at least 15 h/day to have its positive health-related outcome. This should be advised at the time of prescription of LTOT and ensured at follow-up. Apart from COPD, posttuberculous OAD and ILD also constitute a significant population of patients on LTOT. We suggest developing a national registry system for all the patients with indication for LTOT. This will enable us to monitor in terms of technical services and national data on adherence and clinical outcomes. Also, we propose that insurance companies should make LTOT available to those requiring LTOT. The efforts are also needed in the direction of developing oxygen nurse in order to ensure the compliance and reassess the patients. We also need to reduce the burden of tuberculosis related OAD. The awareness regarding giving proper instruction to patients and titrating the oxygen needs to be created. Box 1 summarizes the instructions that need to be followed by the physicians and to be given to the patients. So, we need to cover a long way to match the oxygen therapy protocols followed in a developed nation. ''Box 2 summarises the key messages from our study.'' after the sentence ending with 'and to be given to the patients'.

Box 1: Instructions to be followed by physicians at the time of long term oxygen therapy prescription

The daily duration of usage of LTOT should be prescribed. It should be at least 15 h/day to have a beneficial effect
The oxygen flow rate should be prescribed based on titration with arterial blood gas analysis
The instructions regarding the use and care of oxygen delivery device and system should be explained
The possible adverse effects related to usage of LTOT should be explained to the patients
The advice on smoking cessation and potential dangers of continuing smoking being on LTOT should be explained
The need and adherence to LTOT should be reassessed at each follow up

Box 2: Key messages from the study

Development of a national registry system for all patients with indication for LTOT
Inclusion of LTOT in the insurance schemes
Improvement of the awareness regarding proper instruction to patients on LTOT
Titration of oxygen prior to LTOT prescription
Recognition of tuberculosis related OAD
Facilitation of oxygen nurses to ensure the compliance to LTOT and home monitoring
Reassessment of patients on LTOT every 3 months for further need or stoppage

LTOT: Long term oxygen therapy, OAD: Obstructive airway disease

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Conflicts of interest

There are no conflicts of interest.

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ANNEXURE

Annexure 1: Patient Pro forma

Name

Age

Sex

IP Number

Phone number

Relationship of the interviewee with the patient:

Smoking status: Ex smoker/Current smoker

Smoking index:

Did the patient quit after starting LTOT?

Was the advice on smoking cessation reinforced after LTOT and patient continued quit after LTOT?

The disease that the patient suffered from: COPD/Post tuberculosis obstructive airway disease/ILD/Others

Duration for which LTOT is/was received:____ months/years

What is the duration of use of LTOT?

ABG (pH/PCO2/PO2/HCO3/Saturation):

Spirometry–

Date	Predicted	Pre (absolute/% pred)	Post
FVC			
FEV1			
FEV1/FVC			

2 D ECHO:

Treatment given:

ICS + LABA

LAMA

Others

Vaccination

Rehabilitation

How many hours per day oxygen was advised?

No of Hours per day oxygen used:

No of months/years oxygen used:

Reason for non-compliance if he/she was non-compliant

No of exacerbation Pre LTOT:

No of exacerbation post LTOT:

Is there any physician responsibible for oxygen prescription?

Has the diagnosis been established?

Any full time person allotted?

Home visits?

Any withdrawal attempt?

Who provided equipment? Nurse/technician/others

Criteria for using LTOT followed- Yes/No

Cognitive assessment performed?

How many days after the precription you got the machine?

Any follow up ABG/Saturation done?

Is the patient Alive