

Study of Insomnia in Chronic Obstructive Pulmonary Disease Patients at a Tertiary Care Centre

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities caused by significant exposure to noxious particles or gases. **Aims and Objectives:** 1. To estimate the proportion of insomnia in Chronic Obstructive Pulmonary Diseases patients, 2. To study the association of insomnia with severity of Chronic Obstructive Pulmonary Diseases among study participants and 3. Assessment of Quality of Life among study participants. **Materials and Methods:** This prospective observational study was conducted in Department of Respiratory Medicine in a tertiary care center and medical college. Written informed consent was taken from all the study participants and those who give consent were enrolled in the present study. Total 159 COPD patients were included in the study, after satisfying the eligibility criteria. The COPD patients were enrolled after satisfying the eligibility criteria given GSAQ Questionnaire to find the presence of insomnia, PSQI for quality of sleep and then SF-36 score questionnaire to assess Quality of Life. Study was conducted for duration of 2 years (August 2018 to December 2020). **Observation and Results:** The most common age group amongst study population was 51 to 60 years (42%) followed by 40 to 50 years (29%) and more than 60 years (29%). There was male predominance (54.5%) in the study population as compared to females (45.5%). The most common occupation amongst study population was farmer (28%) followed by Shopkeeper (23%) and Driver (19%) and most of the study population were obese (65.2%) followed by normal BMI (28.8%) and underweight (6.1%). Most of the study population were Grade 2 dyspnea (36%) followed by Grade 3 (34%) and Grade 4 (16%). Most of the study population were Moderate COPD (45.5%) followed by severe COPD (27.3%) and very severe (21.2%). Comorbidities like Diabetes and Hypertension was observed in 11% and 28% of study population. 29% of study population was ex smokers. 69.57% of ex smokers had more than 20 pack years while 30.43% had less than 20 pack years. The prevalence of insomnia in our study population was 43%. The prevalence of insomnia was most commonly observed in severe COPD (40%) followed by Very severe COPD (35%), Moderate COPD (19%) and mild COPD (6%) and the difference was statistically significant. Mean Physical health score and Mental health score was significantly lower in insomnia patients as compared to non insomnia patients. Mean PSQI was significantly higher in insomniac patients as compared to non insomnia patients. **Conclusion:** 40% of our patients with COPD experienced poor sleep quality. Presence of insomnia in patients with COPD is also associated with increased day time sleepiness and worse QOL.

Keywords: COPD - Chronic Obstructive Pulmonary Disease, GSAQ - Global Sleep Assessment Questionnaire, PSQI - Pittsburgh Sleep Quality Index, SF 36 - Short form 36 Health Survey Questionnaire

1. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities caused by significant exposure to noxious particles or gases¹.

The major and significant risk factor for COPD is Cigarette smoking. With the increase of cigarette smoking intensity there is an equivalent increase in the risk of COPD and the quantification of this risk is routinely done as pack-years. (One pack of cigarettes which is smoked per day for 1 year equals to 1 pack year)². Male gender, cigarette smoking, low socioeconomic status, advanced age and occupational exposure are usually the independent risk factors contributing to COPD³.

In about 10% of the general population it is found that the common sleep complaint is insomnia and it is chronically present⁴. Insomnia is the term applied collectively to complaint involving the chronic inability to obtain adequate sleep. Three principal complaints commonly cited are: 1. Sleep onset insomnia (difficulty in falling asleep), 2. Frequent nocturnal awakening (interrupted sleep characterized by frequent awakenings) and 3. Early morning awakening (here the patient wakes up early in the morning and is not able to fall back asleep)⁵. The insomnia symptoms prevalence was high in subjects who had COPD, this was reported by Klink and Quan⁶. There are many additional evidences furnished by recent study for association between COPD and insomnia⁷. There is decreased productivity and worsening of health related Quality of Life (QOL) due to Primary insomnia which is itself a major and crucial public health problem⁸. Similarly, reduced QOL is an established consequence of insomnia⁸. QOL is reduced in COPD patients⁹.

In one small cross-sectional study, the prevalence of smoking was 35% (apnea-hypopnea index AHI>10) in OSA patients and on comparison in an unmatched group of patients (AHI <5) it was only 18% which was provided by the investigators¹⁰. Smoking has an effect on insomnia which leads to disrupted sleep architecture including sleep deprivation characterized by sleep insufficiency and sleep fragmentation characterized by repetitive short interruptions of sleep¹¹.

The term “overlap syndrome” is used to describe patients with concomitant OSA and COPD.

Patients with overlap syndrome have an. There is an increased rate of hospitalization and mortality in patients who have overlap syndrome which is characterized by patient having both COPD and OSA as compared with COPD alone hence, the current study will be performed to estimate proportion of insomnia in chronic obstructive pulmonary diseases and to study the association of insomnia with severity of chronic obstructive pulmonary diseases among study participants.

2. Materials and Methods

This prospective observational study was conducted in Department of Respiratory Medicine of Dr. Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik, Maharashtra, India. Written informed consent was taken from all the study participants and those who give consent were enrolled in the present study. Total 159 COPD patients were included in the study after satisfying the eligibility criteria. The COPD Patients which were enrolled after satisfying the eligibility criteria given GSAQ Questionnaire to find the presence of insomnia, PSQI for sleep quality and then SF-36 score questionnaire to assess Quality of Life^{12,13,14}. Study was conducted for a duration of 2 years (August 2018 to December 2020).

2.1 Study Setting

Study will be conducted in OPD and IPD of Department of Respiratory Medicine at a tertiary health care institute.

2.2 Duration of Study

August 2018 to December 2020.

- Study Participants
- Sample Size – 159

2.3 Formula for Sample Size Calculation

$$\text{Sample size for one proportion} = \frac{Z^2(P \times Q)}{L^2}$$

Where, Z = critical value = 1.96

P = proportion of patients = 12 %

Q = (1-P)

L = Allowable error = 0.05

2.4 Eligibility Criteria

2.4.1 Inclusion Criteria

- Age group ≥ 40 years irrespective of gender with diagnosed COPD cases.
- Patients giving informed consent.
- Patients with insomnia with (1) sleep onset insomnia (difficulty in falling asleep),
- Frequent nocturnal awakening (interrupted sleep characterized by frequent awakenings).
- Early morning awakening (here the patient wakes up early in the morning and is not able to fall back asleep).

2.4.2 Exclusion Criteria

- Patients having past history of any other pulmonary diseases.
- Patients having medical ailments that could result in disturbed sleep such as OSA, symptomatic heart failure, significant chronic pain, nocturia (where in average is >4 times/night) restrictive lung disease, shift work, anyone with a history which is consistent with a sleep disorder other than insomnia and history of depression;
- If there is inability to obtain informed consent from patients.
- If patients has mental retardation.

2.4.3 Clinical Criteria

The diagnosis of COPD was considered in patient based on Global Initiative for

Chronic Obstructive Pulmonary Disease (GOLD) guidelines (2018). The Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria was used to categorize severity¹³. Dyspnea severity was assessed using the Medical Research Council dyspnea scale¹⁴.

3. Observations and Results

Table 1. Age group distribution

Age group	Frequency	Percent
40 to 50 years	46	29
51 to 60 years	67	42
more than 60 years	46	29
Total	159	100

As seen in the above table, the most common age group amongst study population was 51 to 60 years (42%) followed by 40 to 50 years (29%) and more than 60 years (29%).

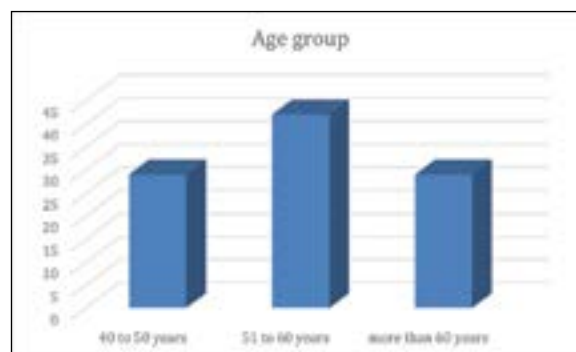


Table 2. Gender distribution

Gender	Frequency	Percent
Female	72	45.5
Male	87	54.5
Total	159	100

As seen in the above table, there was male predominance (54.5%) in the study population as compared to females (45.5%).

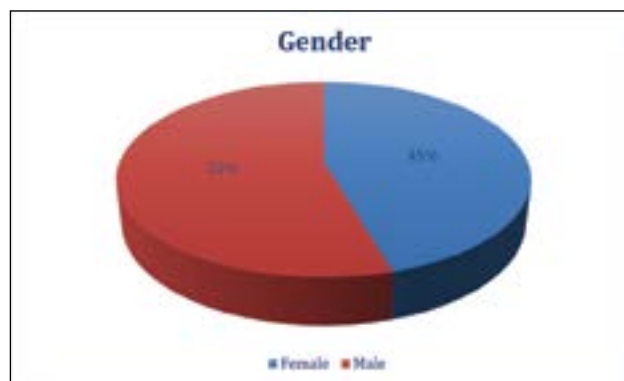


Table 3. Occupation

Occupation	Frequency	Percent
Housewife	17	11
Business	19	12
Shopkeeper	37	23
Driver	30	19
Construction	11	7
Farmer	45	28
Total	159	100

As seen in the above table, the most common occupation amongst study population was farmer (28%) followed by Shopkeeper (23%) and Driver (19%).

Table 4. Body Mass Index

BMI	Frequency	Percent
Underweight	10	6.1
Normal	46	28.8
Obese	104	65.2
Total	159	100

As seen in the above table, most of the study population were obese (65.2%) followed by normal BMI (28.8%) and underweight (6.1%).

Table 5. Grade of MMRC dyspnea

MMRC	Frequency	Percent
Grade 1	22	14
Grade 2	57	36
Grade 3	54	34
Grade 4	25	16
Total	159	100

As seen in the above table, most of the study population were grade 2 dyspnea (36%) followed by Grade 3 (34%) and Grade 4 (16%).

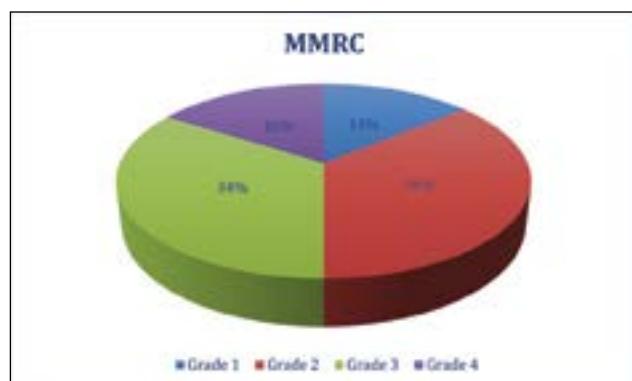


Table 6. Severity of COPD according to GOLD criteria

GOLD FEV1	Frequency	Percent
Mild	10	6.1
Moderate	72	45.5
Severe	43	27.3
Very severe	34	21.2
Total	159	100

As seen in the above table, most of the study population were Moderate COPD (45.5%) followed by severe COPD (27.3%) and Very severe (21.2%).



Table 7. Comorbidities

Comorbidities	Frequency	Percent
Diabetes	17	11
Hypertension	45	28

As seen in the above table, Comorbidities like Diabetes and Hypertension was observed in 11% and 28% of study population respectively.

Table 8. Ex smoker

Ex smoker	Frequency	Percent
No	113	71
Yes	46	29
Total	159	100

As seen in the above table, 29% of study population was ex smokers.

Table 9. Pack years

Pack years	Frequency	Percent
Less than 20	14	30.43
More than 20	32	69.57
Total	46	100.00

As seen in the above table, 69.57% of ex smokers had more than 20 pack years while 30.43% had less than 20 pack years.

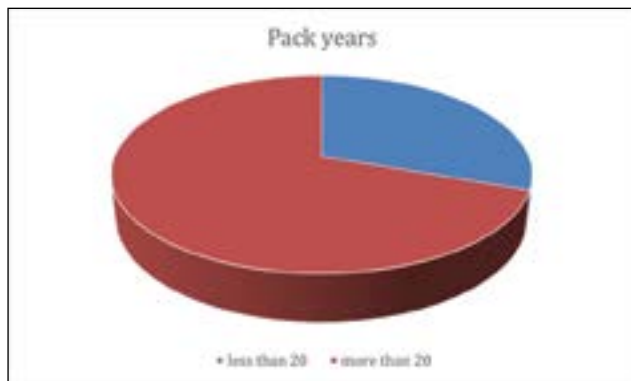


Table 10. Prevalence of insomnia

Prevalence of insomnia	Frequency	Percent
Yes	68	43
No	91	57
Total	159	100

As seen in the above table, the prevalence of insomnia in our study population was 43%.

Table 11. Prevalence of insomnia vs. severity of COPD

Severity of COPD	Insomnia		Total
	Yes	No	
Mild	4 (6%)	6 (7%)	10 (6%)
Moderate	13 (19%)	59 (65%)	72 (45%)
Severe	27 (40%)	16 (18%)	43 (27%)
Very severe	24 (35%)	10 (11%)	34 (21%)
Total	68 (100%)	91 (100%)	159 (100%)

As seen in the above table, the prevalence of insomnia was most commonly observed in severe COPD (40%) followed by Very severe COPD (35%), Moderate COPD (19%) and mild COPD (6%) and the difference was statistically significant.

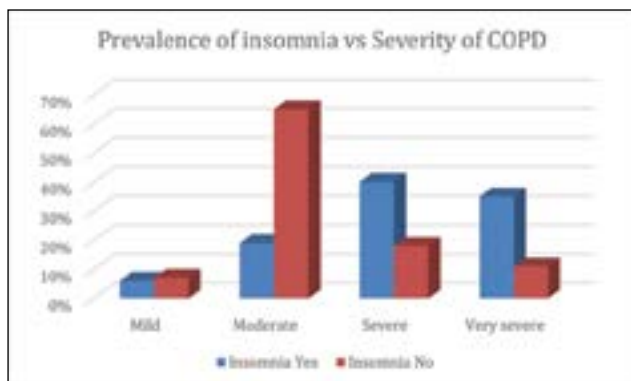


Table 12. Prevalence of insomnia vs. Quality of Life

SF 6	Insomnia		P value
	Yes	No	
Physical health score	32.54 ± 12.41	95.9 ± 33.49	0.0010
Mental health score	54.89 ± 14.56	86.56 ± 29.35	0.0010

As seen in the above table, mean Physical health score and mental health score was significantly lower in insomnia patients as compared to non insomnia patients.

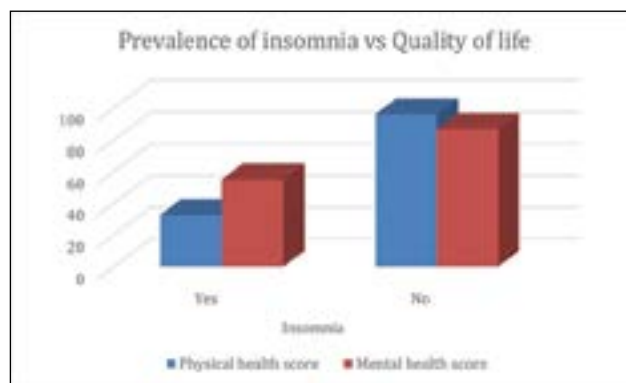


Table 13. Prevalence of insomnia vs. PSQI

PSQI	Insomnia		P value
	Yes	No	
PSQI	8.0 ± 2.7	3.2 ± 2.1	0.0010

As seen in the above table, mean PSQI was significantly higher in insomniac patients as compared to non insomniac patients.

4. Discussion

Chronic Obstructive Pulmonary Disease (COPD) is a disease which is chronic and progressive which is characterized by a decline in respiratory function, exercise capacity and health status which is inevitable¹⁸. The prevalence of COPD is increasing worldwide as is tobacco usage¹⁹.

In about 10% of the general population it is found that the common sleep complaint is insomnia and it is chronically present⁴. There is decreased productivity and worsening of health related Quality of Life (QOL) due to Primary insomnia which is itself a major and crucial

public health problem⁸. However, nearly little attention and importance has been given to insomnia in medical disorders which includes Chronic Obstructive Pulmonary Disease (COPD).

4.1 Age group

In the present study, the most common age group amongst study population was 51 to 60 years (42%) followed by 40 to 50 years (29%) and more than 60 years (29%). Similarly in the study conducted by the Asif Hasan et al., maximum number of patients of COPD had their onset of disease in between 41-50 years²⁰. Guleria et al., have reported similar findings in their study where the maximum number of patients had age of onset between 40-70 years²¹. This findings is in agreement with the study by Narayanagowda et al., in which out of one hundred and seven (107) patients, the most common age group was 55 to 65 years (40.19%). The next common age group was 65 to 75 years (32.71%)²². This is because it was more commonly seen in patients who had lung disease which was advanced. This expresses and shows at the bronchial mucosal level that there is marked deterioration in host defenses²³.

4.2 Gender

In the present study, there was male predominance (54.5%) in the study population as compared to females (45.5%). COPD is a male dominant disease, due to higher prevalence of smoking in male gender and also males are more susceptible to smoking than females. Hence there is high prevalence of COPD in males²⁴. This findings correlate well with the study conducted by Niranjana Mambally Rachaiah et al., in which males accounted for 88%, with a male-female ratio of 6.33:1²⁵. In the present study all males were smokers, 6 female patients were non smokers but all of them were exposed to smoke of burnt fuels which is very common in rural Indian population. In this part of the country which is rural India, cooking is mainly done by using wood and cow dung. This is possibly a strong risk factor for development of COPD among female patients²⁶. This findings is in agreement with the study by Narayana Gowda et al., in which out of 107 patients, 72 were male patients²².

4.3 Occupation

In the present study, the most common occupation amongst study population was Farmer (28%) followed by Shopkeeper (23%) and Driver (19%).

4.4 BMI

In the present study, most of the study population were obese (65.2%) followed by normal BMI (28.8%) and underweight (6.1%).

4.5 Dyspnea

In the present study, most of the study population were grade 2 dyspnea (36%) followed by Grade 3 (34%) and Grade 4 (16%). Similarly in the study conducted by Sunil Babu M et al., 100% of the patients presented with breathlessness and cough¹⁵. Many had peripheral edema and distension of the abdomen. Padmavathi et al., reported dyspnea in 100%, pedal edema in 90.4% and cyanosis in 83.2% of group²⁷.

4.6 Severity of COPD

In the present study, most of the study population were Moderate COPD (45.5%) followed by severe COPD (27.3%) and Very severe (21.2%). This findings is agreement with the study conducted by Ladeira et al., in which GOLD stage B (50%) followed by GOLD stage C (28%)²⁸.

4.7 Comorbidities

In the present study, comorbidities like Diabetes and Hypertension was observed in 11% and 28% of study population respectively. This findings is in agreement with the study by Abraham M Ittyachen et al., in which 9 (27.1%) had diabetes mellitus, 20 patients (28.6%) had hypertension²⁹.

4.8 Smoking

In the present study, 29% of study population were Ex-smokers in which 69.57% of ex-smokers had more than 20 pack years while 30.43% had less than 20 pack years. Similarly the study by Narayana Gowda et al., in which out of seventy two (72) 45 (62.5%) were smokers and twenty seven (27) (37.5%) were non-smokers²².

4.9 Prevalence of Insomnia

In the present study, the prevalence of insomnia in our study population was 43%. The prevalence of insomnia was most commonly observed in severe COPD (40%) followed by Very severe COPD (35%), Moderate COPD (19%) and mild COPD (6%) and the difference was statistically significant. Similarly in the study conducted by Rohit Budhiraja et al. there was no difference in FEV1 value among participants with insomnia (48.9% predicted) or those without insomnia (44.7% predicted, $P = 0.17$). In different GOLD stages of COPD the prevalence of insomnia was not significantly different³⁰. In various studies it was found out that about 34%–78% is the estimated prevalence of disturbed sleep in COPD patients^{6,31,32}. Study by Sameer Vaidya et al. found that the prevalence of sleep disorders in COPD was 66 out of which 31% had an overlap of two or more disorders. The prevalence in COPD patients was significantly higher than the healthy adults ($P < 0.001$). In COPD the most common sleep disorder was found to be insomnia, whereas it was shown that a healthy population may have disturbed sleep by GSAQ and this disturbed sleep was commonly due to anxiety/depression³³. The prevalence of disturbed sleep varied between 20.0% and 34.2% in a study on a healthy population from South India and in our study, it was 16%³⁴. Sameer Vaidya et al. also reported that patients have a higher propensity of developing sleep disorder those who have a lower FEV1³³. Some previous studies have also found that patients having more severe COPD also have worse sleep have been found in some previous studies^{34,35}.

4.10 Quality of Life vs. Insomnia

In the present study, mean Physical health score and Mental health score was significantly lower in insomnia patients as compared to non-insomnia patients. The QoL of patients with COPD may therefore be influenced by the quality of sleep, as observed by a previous study conducted on a small sample³⁶. A consecutive survey concluded that the predictor of poor QoL in patients with COPD is poor sleep quality as measured with both specific and generic tools³⁷. QoL decreases when sleep disorders increase this was found and confirmed by Akinici and Yildirim (2013)³⁸.

In the present study, mean PSQI was significantly higher in insomniac patients as compared to non-insomnia patients. This findings was comparable with the study conducted by Lucia Dignani et al. Sleep was

altered (PSQI > 5) in 83.3% of subjects with COPD³⁹. This percentage is greater than the percentages of other studies which ranged between 75% and 78%^{40,41}.

5. Conclusion

40% of our patients with COPD experienced poor sleep quality. Presence of insomnia in patients with COPD is also associated with increased daytime sleepiness and worse QOL. Considering the disease burden of COPD and insomnia, these results have important clinical and public health implications. In order to ascertain the causality of factors associated with insomnia in patients with COPD prospective studies need to be designed.

6. References

1. Global initiative for Chronic Obstructive Lung Disease, Inc. Gold website www.goldcopd.org. Pocket guide to COPD diagnosis, management and prevention. A Guide for Health Care Professionals. 2018 report; 2.
2. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J, et al, eds. *Harrisons principle of internal medicine*. New York: McGraw-Hill Education. Pulmonology: Chronic Obstructive Pulmonary Disease. (19th ed). Section 9. 2016; 131:718.
3. Caballero A, Torres-Duque CA, Jaramillo C. Prevalence of COPD in five Colombian cities situated at low, medium and high altitude. *Chest*. 2008; 133(2):343–9. PMID: 17951621. <https://doi.org/10.1378/chest.07-1361>
4. Ohayon M. Epidemiological study on insomnia in the general population. *Sleep*. 1996; 19:S7–15.
5. Riba FJ. Insomnia behavioural and cognitive intervention. Behavioural science learning modules. Division of Mental Health World Health Organization Geneva. 1993:1.
6. Klink M, Quan SF. Prevalence of reported sleep disturbances in a general adult population and their relationship to obstructive airways diseases. *Chest*. 1987; 91:540–6.
7. Bellia V, Catalano F, Scichilone N, et al. Sleep disorders in the elderly with and without chronic airflow obstruction: The SARA study. *Sleep*. 2003; 26:318–23. PMID: 12749552. <https://doi.org/10.1093/sleep/26.3.318>
8. Zammit GK, Weiner J, Damato N, Sillup GP, McMillan CA. Quality of Life in people with insomnia. *Sleep*. 1999; 22:S379–85.
9. Desikan R, Mason HL, Rupp MT, Skehan M. Health-related Quality of Life and healthcare resource utilization by COPD patients: A comparison of three instruments. *Qual Life Res*. 2002; 11:739–51. PMID: 12482158. <https://doi.org/10.1023/A:1020836719321>

10. Kashyp R, Hock LM, Bowman TJ. Higher prevalence of smoking in patients diagnosed as having obstructive sleep apnea. *Sleep Breath.* 2001; 5(4):167–72.
11. Series F, Roy N, Marc I. Effects of deprivation and sleep fragmentation on upper
12. airway collapsibility in normal subjects. *Am J Respir Crit Care Med.* 1994; 150(2):481–5.
13. Marin JM, Soariano JB, Carrizo SJ, Boldova A, Celli BR. Outcomes in patients with Chronic Obstructive Pulmonary Diseases and obstructive sleep apnea: the overlap syndrome. *AM J Respir Crit Care Med.* 2010; 182(3):325–31. PMID: 20378728. <https://doi.org/10.1164/rccm.200912-1869OC>
14. Fabbri LM, Hurd SS. Global strategy for the diagnosis, management and prevention of COPD: 2003 update. *Eur Respir J.* 2003; 22:1–2.
15. Fletcher CM. Standardised questionnaire on respiratory symptoms: A statement prepared and approved by the MRC Committee on the Aetiology of Chronic Bronchitis (MRC breathlessness score). *BMJ.* 1960; C2:1662.
16. Roth T, Zammit G, Kushida C, et al. A new questionnaire to detect sleep disorders. *Sleep Med.* 2002; 3:99–108. [https://doi.org/10.1016/S1389-9457\(01\)00131-9](https://doi.org/10.1016/S1389-9457(01)00131-9)
17. McHorney CA, Ware JE, Lu JFR, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36): III. tests of data quality, scaling assumptions and reliability across diverse patient groups. *Med Care* 1994; 32(4):40–66. PMID: 8277801. <https://doi.org/10.1097/00005650-199401000-00004>
18. Mollayeva T, Thurairajah P, Burton K, et al. The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. *Sleep Med Rev.* 2016; 25:S62.
19. Stockley RA. Neutrophils and the pathogenesis of COPD. *Chest* 2002; 121 5 Suppl:151S–5S. PMID: 12010844. https://doi.org/10.1378/chest.121.5_suppl.151S
20. Lopez AD, Murray CC. The global burden of disease, 1990–2020. *Nat Med.* 1998; 4:1241–3.
21. Hasan A, Uwais Ashraf M, Naaz S, Bhargava R, Ashraf J. A study of clinical and echocardiographic profile of patients of Chronic Obstructive Pulmonary Disease helping in early diagnosis of Corpulmonalinternational Journal of Enhanced Research in Medicines and Dental Care. 2014; 1(2):5–8.
22. Guleria JS, et al. *American Review Res Dis.* 1969; 100:490.
23. Narayana Gowda DS, Golia S, Jaiswal J, Manasa SS. A bacteriological study of acute exacerbation of Chronic Obstructive Pulmonary Disease over a period of one year. *Int J Res Med Sci.* 2015; 3:3141–6.
24. Anthonisen NR, Manfreda J, Warren CP, Hershfield ES, Harding GK, Nelson NA. Antibiotic therapy in exacerbations of Chronic Obstructive Pulmonary Disease. *Ann Intern Med.* 1987; 106:196–204. PMID: 3492164. <https://doi.org/10.7326/0003-4819-106-2-196>
25. Dirkje PS, Huib KAM. Epidemiology and natural history of Chronic Obstructive Pulmonary Disease. Gibson G John, Geddes M Duncan, Costabel Ulrich, Sterk J Peter, Corrin Bryan, ed. *Respiratory Medicine.* 3rd ed. Saunders 2003; 2:1109–20
26. Rachaiah NM, Rachaiah JM, Krishnaswamy RB. A correlative study of spirometric parameters and ECG changes in patients with Chronic Obstructive Pulmonary Disease. *Int J Biol Med Res.* 2012; 3(1):1322–6.
27. Wig KL, Guleria JS, Bhasin RC, Holmes JR. E, Vasudeva YL, Singh H. Certain clinical and epidemiological aspects of chronic bronchitis as seen in Northern India. *Indian J Chest Dis.* 1964; 6:183–94.
28. Sunil Babu M, Praveen N, Naik V. A study of clinical profile, radiological features, electrocardiographic and echocardiographic changes in chronic corpulmonale in a rural hospital. *Journal of Evolution of Medical and Dental Sciences.* 2013 Nov; 2(45):8827–40. <https://doi.org/10.14260/jemds/1532>
29. Ladeira, et al., The overall impact of COPD (CAT) and BODE index on COPD male patients: Correlation? *Rev Port Pneumol.* 2015; 21:11–5.
30. Ittyachen AM, et al., Predictors of outcome in patients admitted with acute exacerbation of Chronic Obstructive Pulmonary Disease in a rural Tertiary Care Center. *J Family Med Prim Care.* 2016 Apr-Jun; 5(2):411–5. PMID: 27843851 PMID: PMC5084571. <https://doi.org/10.4103/2249-4863.192365>
31. Budhiraja R, Parthasarathy S, Budhiraja P, Habib MP, Wendel C, Quan SF. Insomnia in patients with COPD. *Sleep.* 2012; 35:369–75. PMID: 22379243 PMID: PMC3274338. <https://doi.org/10.5665/sleep.1698>
32. Sleep Quality in COPD. Last accessed on 2019 May 31. Available from: <http://www.thoracic.org/copd-guidelines/for-healthprofessionals/management-of-stable-copd/sleep/sleep-problems-in-copd.php>
33. Gothi D. Sleep disorders in chronic obstructive pulmonary disease. *Indian J Sleep Med.* 2015; 10:11–21. <https://doi.org/10.1017/S1431927615014439>
34. Vaidya S, Sah RB, Teotiya A, Gothi D. Evaluation of sleep disorders in Chronic Obstructive Sleep Disease patients by subjective questionnaire and their correlation with FEV1, PaO2 and PaCO2. *Indian J Sleep Med.* 2017; 12:60–3. <https://doi.org/10.5005/jp-journals-10069-0012>
35. Panda S, Taly AB, Sinha S, Gururaj G, Girish N, Nagaraja D. Sleep-related disorders among a healthy population in South India. *Neurol India.* 2012; 60:68–74. PMID: 22406784. <https://doi.org/10.4103/0028-3886.93601>
36. Budhiraja TA, Siddiqi, Quan SF, Sleep disorders in Chronic Obstructive Pulmonary Disease: Etiology, Impact and

- Management. *J Clin Sleep Med.* 2015 Mar 15; 11(3):259–70. PMID: 25700872 PMCID: PMC4346647. <https://doi.org/10.5664/jcsm.4540>
37. Nunes DM, Mota RM, de Pontes Neto, OL, Pereira ED, de Bruin VM, de Bruin PF Impaired sleep reduces Quality of Life in Chronic Obstructive Pulmonary Disease. *Lung.* 2009; 187:159–63. PMID: 19399553. <https://doi.org/10.1007/s00408-009-9147-5>
 38. Scharf SM, Maimon N, Tuval TS, Bernhard-Scharf BJ, Reuveni H, Tarasiuk A. Sleep quality predicts Quality of Life in Chronic Obstructive Pulmonary Disease. *International Journal of Chronic Obstructive Pulmonary Disease.* 2011; 6:1–12.
 39. Akinci AC, Yildirim E. Factors affecting health status in patients with Chronic Obstructive Pulmonary Disease. *International Journal of Nursing Practice.* 2013; 19(1):31–8.
 40. Lucia Dignaniet L. Sleep and Quality of Life in people With COPD: A descriptive correlational study. *Clinical Nursing Research.* 2015; 1–16.
 41. Agusti A, Hedner J, Marin JM, Barbe F, Cazzola M, Rennard S. Nighttime symptoms: A forgotten dimension of COPD. *European Respiratory Review.* 2011; 20:183–94.
 42. Price D, Small M, Milligan G, Higgins V, Gil EG, Estruch J. Impact of night-time symptoms in COPD: A real-world study in five European countries. *International Journal of Chronic Obstructive Pulmonary Disease.* 2013; 8:595–603.

Abbreviations

AVAPS - Average Volume Assured Pressure Support
 Auto-PEEP – Auto Positive End Expiratory Pressure
 Ahi – Apnea Hypoapnea Index
 Bilevel PAP - Bilevel Positive Airway Pressure
 BMI – Body Mass Index
 CAT – COPD Assessment Test
 CBT I – Cognitive Behavioural Therapy for Insomnia
 CDRQ- Chronic Respiratory Disease Questionnaire
 COPD – Chronic Obstructive Pulmonary Disease
 CRP - C Reactive Protein
 CPAP - Continuous Positive Airway Pressure
 DSM 4 – Diagnostic and Statistical Manual of Mental Disorders - 4
 E-selectin –CD62 Antigen like Family Member E

EPESE questionnaire– Established Populations for Epidemiologic Studies of the Elderly
 FEV 1 – Forced Expiratory Volume During First Second
 FVC – Forced Vital Capacity
 FRC - Functional Residual Capacity
 GSAQ – Global Sleep Assessment Questionnaire
 GOLD – Global Initiative for Chronic Obstructive Lung Disease
 GERD – Gastroesophageal Reflux Disease
 HIF-1 - Hypoxia Inducible Factor-1 Pathway
 IRLSSG - International Restless Legs Syndrome Study Group
 iVAPS - Intelligent Volume Assured Pressure Support
 IL-6 - Interleukin 6
 ICAM-1 - Intracellular Adhesion Molecule-1
 INS group – Individuals with Insomnia
 IL-8 – Interleukin 8
 LLN – Lower Limits of Normal
 MT receptor - Melatonin Receptor
 Mmrc dyspnea scale – Modified Medical Research Council Dyspnea Scale
 NIPPV - Nocturnal Intermittent Positive Pressure Ventilation
 Or - Odds Ratio
 OSA – Obstructive Sleep Apnea
 PSG- Polysomnography
 PSQI – Pittsburgh Sleep Quality Index
 PETCO2 - End Tidal Carbon Dioxide
 Pcrit - Passive Critical Closing Pressure
 Qol – Quality of Life
 REM – Rapid Eye Movement
 RLS - Restless Leg Syndrome
 SaO2 – Oxygen Saturation
 Sdv - Sleep Disordered Breathing
 SSRI – Selective Serotonin Reuptake Inhibitors
 SF-36 Questionnaire – Short form 36 Health Survey Questionnaire
 Sgrq- St. George’s Respiratory Questionnaire
 tcPCO2 - Transcutaneous PCO2
 TNF-α - Tumor Necrosis Factor alpha
 VEGF - Vascular Endothelial Growth Factor
 VCAM-1 – Vascular Cell Adhesion Molecule-1

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