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Prevalence of Obstructive Sleep Apnea in COPD Patients

A.G.El-Gazzar, O.I.Mohammad, M.E.Elnaggar and S.M.Hassan
Chest Diseases Dept., Faculty of Medicine, Benha Univ., Benha, Egypt
E-Mail: S.M.@gmail.com

Abstract

COPD is a significant worldwide pestilence and has as of late become the third driving reason for death in created nations. The conjunction of COPD and OSA, known as Overlap Syndrome (OS) and is known to expand the danger of foundational maladies. Patients with COPD-OSA have a high danger of death just as expanded danger of intensifications if OSA stays untreated. This work expected to evaluate the commonness of OSA in COPD patients. This imminent observational investigation was led on 100 patients with stable COPD who were gone to at chest division, outpatient facility Benha college clinics for follow up between June 2017 and June 2019. Overnight polysomnography (PSG) was made for all patients. Commonness of OSA expanded with increment COPD seriousness with absolute pervasiveness of 60% (P esteem <0.001). AHI was essentially higher in stout COPD patients (P esteem = 0.04). Huge positive connections were found among AHI and oxygen desaturation record, neck periphery and BMI in stout COPD patients. High pervasiveness of rest disarranged taking in patients with moderate to serious COPD, Obese COPD more vulnerable to create OSA and AHI expanded with increment COPD seriousness prompting more confusion and presented COPD patient to nighttime hypoxaemia which decline personal satisfaction.

1. Introduction

Persistent obstructive aspiratory malady (COPD) is the third driving reason for death in created nations [1]. It is portrayed by tenacious respiratory indications and wind current impediment that is because of aviation route or potentially alveolar anomalies generally brought about by noteworthy presentation to poisonous particles or gases [2]. Obstructive Sleep Apnea (OSA) which is a rest related breathing issue portrayed by tedious scenes of complete or halfway upper aviation route impediment happening during rest bringing about nighttime hypoxemia and feelings of excitement from rest [3].

The conjunction of COPD and OSA, known as Overlap Syndrome (OS) was first depicted by David Flenley right around 30 years prior , he called attention to that a rest study ought to be considered in corpulent COPD patients , in the individuals who wheeze or the individuals who whine of migraine following nighttime oxygen treatment to decide the presence of related OSA [4]. Patients with COPD-OSA have a high danger of death just as expanded danger of intensifications if OSA stays untreated [5]. In patients with OSA, the presence of COPD expands the danger of death 7 overlay. Subsequently, assessing the presence of OSA in patients with cutting edge COPD appears to be consistent as simultaneousness of these illnesses may possibly clarify the high cardiovascular bleakness and mortality in these patients [6].

2. Aim of the work

The aim of this study is to assess the prevalence of OSA in COPD patients.

2. Patients and methods

2.1 Study selection

This prospective observational study was conducted on 100 patients with stable COPD who were attended at chest department, outpatient clinic Benha university hospitals for follow up in the period between June 2017 and June 2019. COPD patients were divided according to their BMI into two groups: (7)

Group A: 75 obese COPD patients (BMI ≥30 kg/m2).

Group B: 25 non obese COPD patients (BMI ≤ 30 kg/m2).

2.2 Exclusion criteria

- Patients with acute exacerbation of COPD
- Patients with decompensated heart failure, thyroid dysfunction & ENT causes of OSA.

2.3 Study description

Patients with technically compromised polysomnograms (including those where percentage failure of flow signal was 20% or greater) and patients who spent less than 4 h in bed.

All patients included in this work were subjected to the following:

1- Intensive history taking including smoking index (number of cigarette smoked per day × years of tobacco use) and clinical examination. Severity of dyspnea was surveyed by modified medical research council (mMRC) dyspnea scale (8). The mMRC dyspnea scale was translated into Arabic language according to Alyami et al.(9).

2- Questionnaires to assess sleep quality: the Epworth sleepiness scale (ESS) (10) which was translated into Arabic language according to Anwar et al., (11) and STOP-Bang questionnaire (12).

3- Pulmonary function tests (PFTs) were done using JAEGER carefusion Germany 234 GmbH Lelbnizstr .7, 97204 Hoechberg, Germany. PFTs were done during stability of the disease. Patients were characterized by their postbronchodilator forced expiratory volume in first second (FEV1) into mild (FEV1 ≥ 80% anticipated), moderate (50%≤FEV1 < 80% anticipated), severe (30%≤FEV1 < 50% anticipated).

4- Echo cardiography.

5- Overnight Polysomnography (SOMNO Screen Plus; SOMNO Medics GmbH, Randersacker, Germany). The polysomnograghy consists of pulse oximetry,

electroencephalogram, electrooculogram, ECG, electromyogram, thoracic and abdominal belts, body position sensor, assesement of respiraratory flow and pressure by nasal thermistor and nasal cannula and bipolar channel limb movements (tibialis anterior). Electrodes and sensors were directly attached to patients by sleep physiologist. Data acquisition was obtained immediately after signal detection by preprocessed computer (DOMINO Software, ver. 2.6.0; SOMNO Medics GmbH).

2.4 Statistical analysis [13]

The collected data were computerized and statistically analyzed using SPSS program (Statistical Package for Social Science) version [24].

Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ($\chi 2$) and Fisher exact was used to calculate difference between qualitative variables as indicated. Quantitative data were expressed as median and range for being non-parametric data (not normally distributed). Mann Whitney test were used to calculate difference between quantitative variables in two groups for non-parametric variables. Spearman's correlation tests were used for correlating non-parametric variables. The (+) sign was considered as indication for direct correlation i.e. increase frequency of independent lead to increase frequency of dependent & (-) sign as indication for inverse correlation i.e. increase frequency of independent lead to decrease frequency of dependent, also we consider values near to 1 as strong correlation & values near 0 as weak correlation. All statistical comparisons were two tailed with significance Levelof P-value≤ 0.05 indicates significant, p <0.001 indicates highly significant difference while, P> 0.05 indicates Non-significant difference. Enter multiple linear regression analysis was performed in order to model the relationship of AHI with other variables.

3. Results

In the current study, COPD patients were divided into two groups (obese and non obese), both group were matched regarding age and sex distribution, BMI and neck circumference were significantly higher in obese COPD Table (1).

Stop Bang, ESS, mMRC, AHI, RDI and ODI were significantly higher in obese COPD Table (2), OSA severity (presented by AHI) increased with increase COPD severity with statistically significant difference Table (3).

60% of COPD patients were found to have OSA and the higher prevalence was found in severe COPD Table (4).

OSA severity (represented by AHI) was significantly correlated BMI, FEV1, smoking index, sleep questionnaire and polysomnographic parameter Table (5).

Multivariate logistic regression analysis revealed that BMI, Post FEV1, smoking index and baseline oxygen were independent predictors of OSA in COPD patients Table (6).

Table (1) Comparison between the studied groups regarding clinico-demographic data.

Group / parameter		Non-obese N=25	Obese N=75	MW test*	P
		Median (Range)	Median (Range)		
Age(years)		66 (41-87)	66 (50-79)	-0.8	0.409
Smoking Index(pack/year)		30 (10-140)	60 (10-150)	-4.2	<0.001
BMI(kg/m2)		26.7 (20.4-28.5)	43 (31-64)	-7.5	<0.001
Neck Circumference(cm)		32 (30-36)	34 (30-37)	-2.6	0.01
		N (%)	N (%)	X^2	P
Sex	**Male**	20 (19.5%)	58 (58.5%)	0.08	0.78
	Female	5 (5.5%)	17 (16.5%)		

(MW) Mann Whitney test* Chi-square X^2 test BMI: body mass index

Table (2) Comparison of polysomnographic parameters between both OSA groups.

	Non obese Median (Range)	Obese Median (Range)	test	P
Stop Bang	3(2-5)	4(3-7)	-2.8	0.005
ESS	20(11-24)	22(11-24)	-2.7	0.007
mMRC	2(2-3)	3(2-4)	-2.5	0.01
Sleep efficiency	69.4(27-79.5)	67.2(14.2-79)	-0.63	0.52
AHI	18.2(6-72)	30.9(7.6-106.8)	2.01	0.04
RDI	18.2(6-72)	33.2(10-106.8)	2.2	0.03
ODI	15.8(1.6-84.9)	48.5(11-116.1)	2.7	0.007

ESS: Epworth sleepiness scale
mMRC: modified medical research council
AHI: apnea hypopnea index
RDI: respiratory disturbance index
ODI: oxygen desaturation index

Table (3) Comparison of AHI in different degrees of COPD severity.

COPD severity	Mild	Moderate	Severe	KWT	P
AHI index	6 (0.7-16.7)	16.2 (0.5-85.2)	59.6 (25-106.8)	16.7	<0.001

KWT Kruskal-Wallis Test COPD: chronic obstructive pulmonary disease AHI: apnea hypopnea index

Table (4) prevalence of OSA in COPD .

COPD	Mild(N=15)		Moderate(N=51)		Severe(N=34)		Total(N=100)		X^2	P
severity	N	%	N	%	N	%	N	%		
OSA	5	33.3%	25	49.02%	30	88.2%	60	60%	20.5	**<0.001**

COPD: chronic obstructive pulmonary disease OSA: obstructive sleep apnea

Table (5) Correlations between AHI index and certain studied parameters within each group.

Parameters	AHI index			
	Non-obese		Obese	
	r	P	R	P
Age	0.158	0.45	-0.066	0.574
BMI	0.188	0.368	0.504	<0.001
PRE FEV1	-0.68	<0.001	-0.702	<0.001
PRE FVC	-0.007	0.974	-0.653	<0.001
FEV1\FVC	-0.505	0.01	-0.456	<0.001
POST FEV1	-0.708	<0.001	-0.732	<0.001
Smoking Index	0.662	<0.001	0.746	<0.001
Stop Bang	0.435	0.03	0.505	<0.001
Ep worth	0.747	<0.001	0.734	<0.001
mMRC	0.497	0.011	0.571	<0.001
Average O2 Saturation	-0.866	<0.001	-0.861	<0.001
O2 Desaturation Index	0.689	<0.001	0.864	<0.001
Base Line O2 %	-0.751	<0.001	-0.631	<0.001
Neck Circumference	0.536	0.006	0.337	0.003

r = Correlation Coefficient mMRC: modified medical research council BMI: body mass index
Pre FEV1: previous bronchodilator forced expiratory volume in one second Pre FVC: previous bronchodilator forced vital capacity FEV1/FVC: forced expiratory volume in one second on forced vital capacity ratio
Post FEV1: post bronchodilator forced expiratory volume in one second

Table (6) Multiple regression analysis of age BMI, post FEV1, smoking index, base Line O2 % and neck circumference as an independent variable for AHI.

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for β	
	B	SE	β			Lower Bound	Upper Bound
Age	-0.058	0.218	-0.016	-0.268	0.789	-0.491	0.374
BMI	-0.44	0.185	-0.154	-2.376	0.02	-0.808	-0.072
POST FEV1	-0.55	0.221	-0.325	-2.482	0.015	-0.989	-0.11
Smoking Index	0.198	0.093	0.263	2.132	0.036	0.014	0.383
Base Line O2 %	-2.343	0.469	-0.362	-4.992	<0.001	-3.276	-1.411
Neck Circumference	1.746	0.923	0.124	1.892	0.062	-0.087	3.579
Pulmonary hypertention(PHT)	0.158	0.203	0.049	0.777	0.439	-0.246	0.562
(Constant)				224.749			

β: regression coefficient; SE: standard error p< 0.05 is significant.
Dependent Variable: AHI index. BMI: body mass index.
Post FEV1: post bronchodilator forced expiratory volume in one second.

4. Discussion

The presence of both COPD and OSA coinciding was named by Flenley as the "Cover" Syndrome [4]. Helpless rest quality has additionally distinguished dependent on both ESS scale, STOP Bang poll and low rest effectiveness in full polysomonography in these patients. These discoveries might be significant causative danger factors among COPD patients (for example expanded cardiovascular occasions, diminished personal satisfaction) in influenced people [14]. In the current examination, there was huge distinction with respect to smoking record, BMI, neck perimeter in fat and non stout gatherings as they were higher in hefty gatherings. Soler et al., had discovered that from the 44 COPD patients tried out their investigation analyzed by pneumonic capacity tests, a short-term polysomnograpy (PSG) and polls (PSQI, HRQL) were finished. They showed that their members were commonly old (age 66.8 ± 12.1 years), 56% were male. Likewise they had discovered that subjects with COPD-OSA had expanded BMI ($p<0.01$), neck perimeter ($p=0.04$), and fringe critical more noteworthy smoking history ($p=0.06$). One out of four subjects with a BMI <25 were found to have OSA [14]. Likewise, Gunduz et al., had done an examination on 183 COPD patients from Ege University Hospital outpatient center, dyspnea was surveyed by COPD appraisal test (CAT), all patients went through electrocardiography and transthoracic echocardiography, daytime tiredness was evaluated by the Epworth Sleepiness Scale and all patients went through rest test with a versatile gadget. They demonstrated that BMI was essentially higher in OS bunch who were corpulent contrasted with COPD bunch who were non fat (29.6 ± 6.6 versus 25.6 ± 4.9, individually, $P = 0.03$) [15]. Turcani et al., selected 79 COPD patients in an examination and in 35 of these subjects polyg¬raphy was performed. They discovered factually noteworthy connection between (oxygen desaturation record) ODI and weight ($P=0.007$), BMI ($P=0.020$), neck outline ($P=0.001$). Patients with ODI more than 15/h, contrasted and those with ODI under 15/h, had a more prominent weight, BMI and neck perimeter. They likewise found that with increment patients' weight, AHI expanded mirroring the impact of weight on AHI [16]. In the investigation done by Marin et al., on 4241 COPD patients who were surveyed by Epworth Sleepiness Scale and went through a went to expedite polysomnography. They had discovered that ODI, RDI and AHI were higher in the cover condition (OSA and COPD) when contrasted with patients with COPD without OSA [17]. In the current examination OSA increments with expanding COPD seriousness (either fat or non-hefty) with absolute commonness 60%. OSA predominance in non-large COPD was 28% and 70% in hefty patients. Anisa et al., showed that COPD patients with serious degree are 4.39 occasions more serious danger to experience the ill effects of OSA than gentle to direct COPD patients and every centimeter increment of abdomen circuit has higher danger of OSA [18]). Patil et al., found that out of 30 COPD patients 23 had OSA, of which 4 patients (17.33%) had ordinary BMI and 19 patients (82.6%) were overweight [19]. In an examination done by Wan et al., on 106 stable COPD patients. Versatile checking, echocardiography and surveys (ESS and mMRC) were finished. They had discovered a high pervasiveness of OSA in patients with COPD with absolute predominance 52.8% (20). Likewise, Solar et al had discovered a predominance of OSA of 65.9% in patients with affirmed conclusion of moderate to extreme COPD [14]. Then again in the investigation done by Narasimhan et al., on 66 COPD patients who were exposed to expedite Polysomnography and surveys (ESS and mMRC). They found that all out predominance of OSA was 53% [21]. In the current examination OSA seriousness (spoke to by AHI) was essentially corresponded BMI, FEV1, smoking record, rest survey and polysomnographic boundary. Additionally, McNicholas had discovered that patients with COPD were overwhelmingly smokers or ex-smokers. Smoking can prompt aggravation of the upper aviation route which thusly could prompt growing, narrowing, and along these lines expanding the inclination to aviation route conclusion. Undoubtedly OSA was accounted for to be around multiple times more common in ever-smokers than never-smokers [22].

Then again in a comparable new investigation done by Philippe and Ali on 225 COPD patients. They detailed that there was no noteworthy affiliation seen between seriousness of wind current impediment and AHI ($P = .31$). This outcome didn't coordinate the one acquired from the current investigation and this might be clarified by more modest number of patients remembered for the current examination which might be non delegate [23]. Multivariate strategic relapse investigation which uncovered that BMI, Post FEV1, smoking record and benchmark oxygen were autonomous indicators of OSA in COPD patients with no effect of pneumonic hypertention on OSA (reflected by AHI) in COPD patients. An accomplice concentrate on south indian patients, Sreedharan et al., selected 152 patients and polysomnography was done to contemplate segment, clinical, and polysomnographic indicators of OSA seriousness. They had discovered that in multivariate examination among the PSG boundaries, longer apnea term and more extreme nighttime hypoxemia as confirmed by higher desaturation record and nighttime desaturation possessing >10% of complete rest time connected freely with OSA seriousness. They had demonstrated a positive connection of OSA seriousness with nighttime hypoxemia [24]. Likewise, Sun et al., played out an examination on 106 patients with COPD who performed home compact nighttime rest observing and echocardiography. They found that middle aspiratory vein pressure (PAP) were comparable in the COPD with OSA gathering and the COPD without OSA gathering. They didn't discover huge connection among's AHI and PAP [25]. Another examination done by Izabella et al., on 1566 patients with suspected OSA. In the univariate relapse investigation sex, age, BMI, neck circumference(NC), hip circumference(HC), abdomen boundary, ESS and smoking list were related with OS. In the various calculated relapse examination, BMI, NC, HC, ESS and smoking record

were just the autonomous factors for OSA [26]. Additionally, Jing et al., from the 766 COPD patients tried out their examination had discovered that (cover disorder) OS patients had a higher BMI than patients with COPD in particular. Besides, their different relapse examination had discovered that the BMI had a positive relationship with the AHI in OVS patients, which proposed that the BMI is by all accounts a critical indicator for OSA in COPD patients [27]. In the examination done by Sharma et al., on 206 COPD patients who went through polysomnography and pneumonic capacity test. They showed that BMI, male sex, relative-detailed wheezing record and gagging list were free indicators of OSA. BMI, as a nonstop factor, was an essentially free indicator of OSA, proposing accordingly that the danger of creating OSA ascends in a consistent manner with expanding BMI [28].

5. Conclusions

From this study, it can be concluded that:

- High prevalence of sleep disordered breathing in patients with moderate to severe COPD.
- Obese COPD more susceptible to develop OSA.
- AHI increased with increase COPD severity leading to more complication and exposed COPD patient to nocturnal hypoxaemia which decrease quality of life.
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Author contributions

All authors were involved in the study design, analysis, interpretation of the data and revising its content. All authors agree to be accountable for all aspects of the work.

Declaration of interest

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Ethical approval

The Research Ethics Committee at the Faculty of Medicine, Benha University has approved the study. Informed consent was obtained from every single individual member incorporated into the study.

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