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Pulmonary Medicine

SLEEP IN COPD PATIENTS

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ABSTRACT

BACKGROUND: The quality of sleep in chronic obstructive pulmonary disease (COPD) patients has not been studied in Indian population. Aim of the study: was to evaluate the quality of sleep in COPD patients with the help of polysomnography study.

MATERIALS & METHODS: 25 clinically stable patients of COPD were recruited for the study, they were classified based on GOLD classification & polysomnography study was conducted in these patients. RESULTS: Majority of the patients were males & in the age group of 51-70 years, 20% patients in stage1, 52% patients in stage2, 28% patients in stage3 COPD were enrolled. Sleep was affected in 80% of patients with nocturnal desaturation as the commonest abnormality. Sleep variables were affected more in stage 2 & stage 3 COPD patients as compared to stage1.

CONCLUSION: There is a high prevalence of poor sleep quality in COPD patients & nocturnal desaturation was the commonest abnormality among the sleep variables.

KEYWORDS : COPD, POLYSOMNOGRAPHY, SLEEP QUALITY, NOCTURNAL DESATURATION

INTRODUCTION

Sleep is a period of greatest physiologic disturbances in COPD and the time of greatest danger to these individuals, symptoms related to sleep disturbances are common in individuals with COPD commonly manifested as short and disturbed sleep, morning fatigue, insomnia, early awakenings. Sleep aggrevates abnormalities of gas exchange in COPD patients and can cause pulmonary hypertension, cardiac arrhythmias(1).

Sleep related hypoxemia & hypercapnia are well recognized in COPD patients particularly during REM sleep. These abnormalities are most common in blue bloater type of patients who have greater degree of awake hypoxaemia(2).

Nocturnal desaturation in COPD is mainly due to hypoventilation, altered V/Q relationship, impact of oxyhaemoglobin dissociation curve, coexisting sleep apnea(3).

Patients with COPD are subject to a range of sleep-related abnormalities that include poor sleep quality and sleep disordered breathing with associated hypoxaemia.

Polysomnography is a complex procedure consisting of simultaneous recording of sleep and cardiorespiratory parameters, and is usually performed throughout the night. It can detect disorders of ventilation and hypoxemic episodes, and allows us to correlate them with sleep stages.

MATERIALS & METHODS:

The present study was conducted from August 2012 to September 2013 in Kamla Nehru Chest Hospital, Dr S N Medical College, Jodhpur, a tertiary care centre for respiratory diseases in western part of Rajasthan. This study was a prospective cross sectional study of quality of sleep in 25 patients with COPD. Patients of all ages either admitted or attending the Outpatient Clinic of the Department of Tuberculosis & Respiratory Diseases of our Hospital, who presented with signs, symptoms and history suggestive of COPD and willing to participate in the study were enrolled after proper counseling. The protocol was explained to the patient/care provider before enrolment and informed consent was taken from each patient. All patients underwent a complete clinical workup & also spirometry & classified as per GOLD 2011 guidelines. Those who had acute exacerbation of COPD in 4 weeks prior, history of depression or had other chronic systemic illness like malignancy, diabetes mellitus and coronary artery disease, renal or hepatic disease were excluded from the study. All the patients underwent attended nocturnal polysomnography (Level 1) at their approximate routine sleeping hours. The patients were asked to report to sleep lab at 9:00pm after taking consent they were explained what each sensor measures & then hooked to RMS Quest 32 polysomnograph machine. Sleep variables including total sleep time (TST) and sleep efficiency (SE) , Sleep architecture (percentage of TST in various stages of sleep), Decrease in oxyhemoglobin saturation tabulated as percentage of sleep time at SaO2 <90% were tabulated. Nocturnal desaturators were defined as subjects with SPO2 <90% on atleast >5% of TST (Total sleep time) (Sanders et al).

DATA ANALYSIS

Statistical Package for Social Sciences version 17.0 (SPSS Inc, Chicago, IL) was used for data analysis. A P value of less than 0.05 was considered as significant.

RESULTS

TABLE 1
AGE WISE DISTRIBUTION OF PATIENTS IN THE STUDY

AGE GROUP (YEARS)	NUMBER OF PATIENTS	PERCENTAGE
≤40	1	4
41-50	6	24
51-60	7	28
61-70	10	40
71-80	1	4
TOTAL	25	100

This table shows that maximum number of patients were in the age group of 61-70yrs (40%), followed by 51-60yrs (28%)

TABLE 2
GENDER DISTRIBUTION OF PATIENTS ENROLLED IN THE STUDY

SEX	NUMBER	PERCENTAGE
MALES	23	92
FEMALES	2	8
TOTAL	25	100

This Table shows that maximum number of patients enrolled in the study were males (92%), there were only 2 females (8%)

TABLE 3
PATIENT DISTRIBUTION ACCORDING TO GOLD STAGING OF COPD

GOLD STAGE	NO. OF CASES	PERCENTAGE
STAGE 1	5	20
STAGE 2	13	52
STAGE 3	7	28
STAGE 4	0	0
TOTAL	25	100

80% of the patients were suffering from moderate to severe COPD, Mild COPD was seen in 5 patients(20%), None of the patients belonged to very severe group.

TABLE 4

PARAMETERS		STAGE 1 COPD (N=5)	Correlation value	P value
AWAKE	<5	3	-0.568	0.317
	5-10	2		
	>10	0		
STAGEI (NREM)	0-5	4	-0.251	0.684
	6-10	1		
	11-15	0		
	16-20	0		
	>20	0		
STAGEII (NREM)	<45	5	0.786	0.115
	45-55	0		
	56-65	0		
	>65	0		
STAGEIII (NREM)	<10	4	0.076	0.904
	10-20	1		
	>20	0		
STAGEIV (NREM)	<10	2	0.737	0.156
	10-15	3		
	>15	0		
REM	<20	1	-0.893	0.056
	20-25	4		
	>25	0		

TABLE 5

PARAMETERS		STAGE 2 COPD (N=13)	CORRELATION VALUE	P VALUE
AWAKE	<5	3	-0.961	<0.001
	5-10	8		
	>10	2		
STAGEI (NREM)	0-5	2	-0.961	<0.001
	6-10	1		
	11-15	3		
	16-20	1		
	>20	6		
STAGEII (NREM)	<45	4	-0.785	<0.01
	45-55	6		
	56-65	3		
	>65	0		
STAGEIII (NREM)	<10	9	+0.678	<0.05
	10-20	4		
	>20	0		
STAGEIV (NREM)	<10	11	+0.741	<0.01
	10-15	2		
	>15	0		
REM	<20	13	+0.637	<0.05
	20-25	0		
	>25	0		

TABLE 6

PARAMETERS		STAGE 3 COPD(N=7)	Correlation value	P value
AWAKE	<5	0	-0.874	<0.05
	5-10	6		
	>10	1		
STAGEI (NREM)	0-5	4	-0.884	<0.01
	6-10	0		
	11-15	1		
	16-20	1		
	>20	1		
STAGEII (NREM)	<45	0	-0.754	<0.05
	45-55	3		
	56-65	4		
	>65	0		
STAGEIII (NREM)	<10	5	+0.873	<0.05
	10-20	2		
	>20	0		
STAGEIV (NREM)	<10	6	+0.785	<0.05
	10-15	1		
	>15	0		
REM	<20	7	+0.866	<0.05
	20-25	0		
	>25	0		

No significant difference in sleep stages is seen in stage 1 COPD. There was a decrease in stage III and IV NREM and REM stage with corresponding increase in stage I, II NREM. This observation was seen in stage 2 & stage 3 COPD & was statistically significant.

TABLE 7 Comparison of sleep parameters involved in initiation & maintainence of sleep in different stages of copd

PARAMETERS		STAGE 1 COPD (N=5)	STAGE 2 COPD (N=13)	STAGE 3 COPD (N=7)	STAGE 4 COPD (N=0)	TESTS APPLIED		
SE	<50	0	0	0	0	ANOVA		
	50-60	0	2	2	0	F 12.174	DOF 2	P <0.001
	61-70	0	4	4	0			
	71-80	1	6	1	0			
	>80	4	1	0	0			
TST	<100	0	0	0	0	ANOVA		
	100-200	0	1	0	0	F 9.930	DOF 2	P <0.01
	201-300	0	9	7	0			
	>300	5	3	0	0			
SOL	<10	0	0	0	0	ANOVA		
	10-20	5	4	2	0	F 4.684	DOF 2	P <0.05
	21-30	0	5	4	0			
	>30	0	4	1	0			
ROL	<90	3	5	0	0	ANOVA		
	90-100	2	3	3	0	F 4.442	DOF 2	P <0.05
	>100	0	5	4	0			

This table shows that Sleep variables (Sleep efficiency, Total sleep time, Sleep onset latency, REM onset latency) were minimally affected in stage 1 disease as compared to stage 2 and 3 and was also stastically significant.

TABLE 8 Comparison of nocturnal saturation variables in different stage of copd

PARAMETERS		STAGE 1 COPD (N=5)	STAGE 2 COPD (N=13)	STAGE 3 COPD (N=7)	STAGE 4 COPD (N=0)	TESTS APPLIED		
DESATURATION INDEX	<5	5	2	0		ANOVA		
	5-15	0	9	1		F 15.917	DOF 2	P <0.001
	16-25	0	2	6				
	>25	0	0	0				

%TST SPO2<90%	<5	5	3	0		ANOVA		
	5-15	0	8	6		F	DOF	P
	>15	0	2	1		7.681	2	<0.01
AVG.SAT	<80	0	0	0		ANOVA		
	80-90	0	6	5		F	DOF	P
	>90	5	7	2		6.315	2	<0.01
MIN SPO2	≤60	0	1	1		ANOVA		
	61-70	0	4	3		F	DOF	P
	71-80	0	5	3		12.088	2	<0.001
	81-90	3	3	0				
	>90	2	0	0				

Patients with stage 1 disease had lesser degree of nocturnal desaturation as compared to stages 2 and 3 (statistically significant).

DISCUSSION

Our study mainly observed that the sleep was affected in 80% of the patients. Studies from Cormick et al [4], supported this finding.

Sleep efficiency and Total sleep time in most of our patients (80%) was decreased (Krachman et al [5]). Regarding sleep architecture some of the patients preserved normal pattern while majority of them (80%) showed a decrease in slow wave sleep (mean 15.52%) and REM sleep (mean 11.28%) (one of our patient did not present REM sleep) with a corresponding increase in stage I NREM (mean 13.2%) and stage II NREM was also towards the upper limit of normal (mean 52%). Carlos Eduardo Ventura Gaio dos Santos et al [6] also showed similar results.

Most of the patients (68%) showed significant nocturnal desaturation (>5% of TST with SPO2<90%) (mean 8.1%). Lewis et al [7] also confirmed the same fact.

The study also showed that sleep variables (Sleep Efficiency, Total sleep time, sleep stages , Nocturnal desaturation) were minimally affected in stage 1 COPD as compared to other stages, this observation was statistically significant (Sanders et al [8]).

Limitations of our study :-

1. Sample size of the study group was small in number.
2. We did not analyze our data with respect to medication, since COPD patients receive medications that could alter sleep quality and architecture.

CONCLUSION

Our study demonstrated high prevalence of poor quality of sleep among COPD patients & nocturnal desaturation was the commonest abnormality among the sleep variables. Sleep variables were more affected in moderate & severe stage as compared to mild stage. The mechanism of sleep disturbance though is not clear, it may be related to gas exchange abnormalities, medications, severity of COPD, underlying sleep related breathing disorders or general debility associated with COPD. Thus, clinical attention should be given to sleep related features in these patients, which represent underexplored potential for improvements in the clinical features and quality of life among these patients.

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