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Original Article

Utility of Epworth Sleepiness Scale (ESS) in predicting the presence of Sleep Related Breathing Disorders (SRBD) in patients in Routine Respiratory Clinical Service

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Abstract

Background

Many patients attending routine respiratory clinical service in developing countries also present with complains of daytime sleepiness and sleep abnormalities. A large proportion of them might have Sleep Related Breathing Disorders (SRBD) and as such, it is underestimated. Within this background we conducted a study to explore the presence of SRBD among patients presenting with symptom complex of respiratory diseases in Routine Respiratory Clinical Service by use of Epworth Sleepiness Scale (ESS).

Material and Methods

A cross-sectional study of 50 patients with respiratory symptom complex was conducted in respiratory clinical service of Division of Pulmonary, Critical Care and Sleep Medicine at B. P. Koirala Institute of Health Sciences (BPKIHS) from 2014-2015. Targeted Comprehensive Sleep History and Epworth Sleepiness Scale (ESS) were used to recognize the presence of SRBD among these patients.

Results

74% patients had ESS score ≥ 10. Mean ESS was 12.32 (± 4.76). 72% subjects had daytime fatigue, 62% loud snoring, 58% daytime sleepiness and 46% sleep fragmentation. ESS ≥ 10 reflected excessive daytime sleepiness (sensitivity 86.67%; 95% CI, 69.28 – 96.24; specificity 45%, 95% CI, 23.06 – 68.47; PPV 70.27%, 95% CI, 53.02 – 84.13; NPV 69.23%, 95% CI, 38.57 – 90.91).

Conclusion

Epworth Sleepiness Scale has utility in predicting SRBD in patients with respiratory symptom complex with high overall predictive accuracy. It can be used in routine clinical care to identify and predict patients having Sleep Related Breathing Disorder and refer them to clinical sleep services for further evaluation.

Key words:

Epworth Sleepiness Scale, Respiratory Diseases, Sleep Related Breathing Disorder.

Introduction

Respiratory clinics in the developing countries are burdened with myriad presentations of common conditions such as Bronchial Asthma, Chronic Obstructive Pulmonary Disease (COPD), Bronchiectasis and Interstitial Lung Diseases. With the ageing process comes the predisposition to disorders of sleep such as sleep-related breathing disorders (SRBD) and sleep disturbances such as loud snoring, excessive daytime sleepiness, daytime

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fatigue, morning headaches, and nocturnal oxygen desaturations [1]. There is a high prevalence of sleep disorders in subjects with chronic respiratory illnesses [2]. Respiratory comorbidities may mask the common manifestations of sleep disorders, leading to underestimation of its burden in subjects with respiratory diseases, that may cause poorer quality of life and outcomes despite adequate treatment of the chronic respiratory condition [3,4,5,6].

There is scarcity of data on the burden of SRBD in the Nepalese population with respiratory symptom complex, and with the polysomnography test not being readily available, a need to screen sleep disorders in this group of patients is imperative. The Epworth Sleepiness Scale for measuring daytime sleepiness correlated well with results of overnight polysomnography [7,8] and has been used a screening tool for excess daytime sleepiness.

Within this background, the study aimed to explore the presence of SRBD among patients with symptom complex of respiratory diseases in routine respiratory clinical service by use of Epworth Sleepiness Scale.

Materials and Methods

This hospital based cross-sectional study was conducted in the Division of Pulmonary, Critical Care and Sleep Medicine at the Department of Internal Medicine of B. P. Koirala Institute of Health Sciences, a tertiary care university hospital in Eastern Nepal, from May 1, 2014 to September 30, 2015. The Institute's Ethical Review Board approved the study.

Case Definitions:

Respiratory Symptom Complex: A subject was considered to have Respiratory Symptom Complex when there were cardinal manifestations of respiratory disease of a chronic duration, specifically cough with or without expectoration, dyspnea, chest pain, and/or hemoptysis of 3 or more weeks.

Sleep-Related Breathing Disorder (SRBD): SRBD was defined as repetitive episodes of apnea or hypopnea during sleep associated with sleep fragmentation, arousals and oxygen desaturation as documented by portable Apnea Link TM polysomnogram and descriptively defined based on the American Academy of Sleep Medicine Manual for the Scoring of Sleep and Associated Events (version 2.0.2) [9]. For the purpose of the study, SRBD was defined as an Apnea-Hypopnea Index (AHI) of at least 5 events per hour of sleep.

Apnea: Cessation of airflow for 10 seconds or longer during sleep, as documented by polysomnography.

Hypopnea: Decrements in airflow during sleep, and if desaturation occurred, as document by polysomnography.

Desaturation: A fall of 4% or more oxygen saturation from baseline as observed by polysomnography.

Inclusion and Exclusion Criteria: Patients aged at least 18 years, giving informed and written consent, meeting the case definitions of respiratory symptom complex and willing to undergo overnight polysomnography, were included in the study. Subjects with respiratory symptom complex who were in respiratory failure, in need of supplemental oxygen therapy, hemodynamic instability or requiring intensive care support were excluded from the study.

Recruitment of the Patients and Procedure: An informed verbal and written consent was taken. 50 consecutive patients presenting to the routine respiratory clinical service of the Division of Pulmonary, Critical Care and Sleep Medicine, meeting the inclusion criteria were recruited.

A structured proforma gathered data on Targeted Comprehensive Sleep History that included Epworth Sleepiness Scale (ESS), referenced from Johns MW (Sleep 1991)

[7] and questions related to sleep disturbance abnormalities, such as presence of loud snoring, snorting, daytime somnolence, excess daytime sleepiness and morning headache. The Epworth Sleepiness Scale score was based on eight situational and structured short questions pertaining to sleepiness related activities of daily living, with a score of 10 or more reflecting increase probability of excess daytime sleepiness.

Results of the overnight polysomnogram, which was conducted at sleep laboratory using the ResMed ApneaLinkTM polysomnogram (portable) were recorded. Outpatients were admitted directly to the Sleep Room and inpatients were transferred to the room at time of start of sleep study. The Res Med ApneaLink® software was used to automatically analyze and derive Apnea-Hypopnea Index (AHI). The polysomnography study was started at 10:00 pm. The device monitored nasal airflow by nasal pressure transducer, respiratory efforts, chest movements and pulse oximetry. The doctor on duty was trained on the operation of the polysomnograph and mandated to monitor for any mechanical errors and difficulties faced by the subject during the session. The device was promptly stopped after a minimum of 7 hours of sleep time, or at 7:00am, whichever was earlier.

During the enrollment of subjects and the study period, standard clinical care and treatment of the subjects' respiratory symptom complex was provided as per the Institute's protocol.

Data and Statistical Analysis:
The collected data were entered in Microsoft Excel 2007 worksheet and statistically analyzed using the SPSS software version 11.5. Descriptive statistical data were presented as Mean, Standard Deviation, and percentage and proportions. For inferential statistics chi square test with risk ratio were calculated

with a confidence interval of 95%, and a p value of <0.05 inferring statistical significance. For the diagnostic accuracy test of the Epworth Sleepiness Scale, tests for sensitivity, specificity; positive and negative predictive values were carried out.

Results
Of the 50 subjects with respiratory symptom complex presenting to the routine respiratory clinical services of the hospital, the sleep related abnormality questionnaires and the Epworth Sleepiness Scale answered by them showed that 74% subjects had an Epworth Sleepiness Scale score of at least 10. The mean Epworth Sleepiness Scale score was 12.32 (±4.76). The distribution of the Epworth Sleepiness Scale scores is depicted in table 1.

Table 1. Epworth Sleepiness Scale score in patients with respiratory symptom complex attending routine respiratory clinical service

Epworth Sleepiness Scale (ESS) Score	Number	Frequency %
≥10	37	74
<10	13	26

The study observed that many subjects (72%) suffered daytime fatigue attributed to inadequate sleep. 62% of the subjects' partners reported loud snoring; 58% had daytime sleepiness, 46% revealed feelings of restlessness and sleep fragmentation, 24% complained of morning headache, and that 18% of the patients reported having choking or gasping sensation during sleep. The presence of loud snoring in the targeted comprehensive sleep history was significantly associated with SRBD (p value <0.001), and that such subjects were at high risk of development of sleep related breathing disorder (OR 8.582, p value = 0.006, 95% CI 1.842–39.989). sleep related disturbances are depicted in table 2.

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Table 2. Sleep related disturbances in patients with respiratory symptom complex attending routine respiratory clinical service

Sleep Related Disturbances	Number	Frequency %
Loud Snoring	31	62.0
Daytime Sleepiness	29	58.0
Restlessness in sleep and sleep fragmentation	23	46.0
Morning headache	12	24.0
Choking/gasping in sleep	9	18.0

In the study, an Epworth Sleepiness Scale Score cut-off value of 10 reflected excessive daytime sleepiness with a sensitivity of 86.67% and a specificity of 45.00% for detecting the presence of Sleep Related Breathing Disorder in patients presenting with respiratory symptom complex. The utility of Epworth Sleepiness Scale Score in screening for SRBD in such patients is depicted in table 3.

Table 3. Utility of Epworth Sleepiness Scale score in screening for sleep related breathing disorders (SRBD) in patients with respiratory symptom complex attending routine respiratory clinical service

ESS Score Cut-off	AHI ≥ 5 (Mild-Severe SRBD)				
	PPV (95% CI)	NPV (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	AUC
≥ 10	70.27% (53.02 – 84.13)	69.23% (38.57 – 90.91)	86.67% (69.28 – 96.24)	45.00% (23.06 – 68.47)	0.66 (0.51 – 0.86)

Discussion

The study has dealt with the issue of screening for sleep disturbances and sleep related breathing disorders (SRBD) in patients with symptom complex of respiratory diseases presenting to routine respiratory clinical service in a tertiary hospital in eastern Nepal. For this purpose, the Epworth Sleepiness Scale (ESS), a targeted comprehensive sleep history using a sleep disturbance-related questionnaire, and Polysomnography were used to identify presence of sleep related breathing disorder in patients presenting with respiratory symptom complexes.

While most studies available have dealt with the screening of sleep disorders in particular respiratory disorders such as chronic obstructive pulmonary disease or bronchial asthma or the Overlap Syndrome, the present study includes all patients with a respiratory symptom complex.

About a third of the patients visiting health care facilities in developing countries complain of respiratory symptoms, with 28% Nepalese population having respiratory symptoms, [10] and more than 50% of the population suffer from some sleep disturbance, the prevalence of sleep related breathing disorders (SRBD) could be higher. In routine respiratory clinical services in Nepal, sleep disorders are uncommon diagnoses since seldom do such patients present with a sleep related problem. In fact, unmasking sleep related abnormalities from the myriad respiratory manifestations are a clinical challenge.

Daytime fatigue was the most predominant sleep disturbance seen in our study population followed by loud snoring. In fact, patients with respiratory disease who also had problem of loud snoring were at higher risk for development of sleep related breathing disorder (OR 8.582, p value = 0.006, 95% CI 1.842 – 39.989).

The Epworth Sleepiness Scale (ESS) [7] tool is a validated self-answered questionnaire that screens for excessive daytime sleepiness. In a study of the usefulness of the ESS in 50 patients with Chronic Obstructive Pulmonary Disease (COPD), most patients (76.92%) had a normal AHI and ESS score of ≤ 10, and only 4.17% with high AHI had ESS score

of >10, concluding that ESS has no utility as a screening tool in COPD patients with sleep disorders [11]. In the present study, ESS was found to be a very useful instrument to search out those at risk for sleep related breathing disorder. An ESS score of ≥10 in the present study had a sensitivity of 86.67% and specificity of 45% for reflecting sleep-related breathing disorder with an AHI of ≥5 events/hour of sleep, with a positive predictive value of 70.27% (95% CI 53.02 – 84.13) and a negative predictive value of 69.23% (95% CI 38.57 – 90.91). The study results point that patients with symptom complex of respiratory disease who have high ESS scores, and who have sleep disturbance abnormalities, particularly daytime fatigue and loud snoring, may likely have coexistent sleep related breathing disorders (SRBD), and such patients need to be investigated with detailed sleep studies.

The study does have limitations in that it does not use a Class 1 polysomnograph, which would have higher accuracy in diagnosis of sleep related breathing disorders, but limitation of such resources is unavoidable in developing countries.

Conclusion

The study concludes that the Epworth Sleepiness Scale has good utility in predicting the presence of sleep related breathing disorder in patients with symptom complex of respiratory disease who visit the routine respiratory clinical services with high predictive accuracy and conducting a simple self-answered sleep disturbance abnormality questionnaire as an adjunct to the ESS strengthens the probability of presence of SRBD in such patients. The Epworth Sleepiness Scale can be used in routine respiratory clinical care to predict presence of sleep related breathing disorder and refer them to clinical sleep services for further evaluation.

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