The Impact of Obstructive Sleep Apnea on Self-Reported Work Disability among Software Professionals

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Abstract

Objective: Information technologies (IT) professionals might be predisposed to obstructive sleep apnea (OSA) due to the obesity and sedentary nature of their work. Hence the objective of this study was to assess work disability among the IT professionals with OSA.

Methods: This cross-sectional study was performed using self-reported questionnaire on sleep disturbances and work disability. Objective measurement of OSA was made using a portable home based type 4 sleep study.

Results: A total of 74 male IT professionals completed all aspects of the study. Thirty per cent (n=22) were found to have OSA. Those with OSA reported greater work disability as reflected in a decreased work efficiency (89% vs 67%., $p<0.05$) and more frequent change in job (33% vs 9%, $p<0.03$). OSA was most common in individuals who described their job as a supervisor.

Conclusion: OSA is highly prevalent and associated with significant work disability among IT professionals.

Keywords: Work efficiency, Work productivity, Stress.

Introduction

Obstructive sleep apnea (OSA) is a common disorder that is characterised by recurrent respiratory disturbances during night time sleep resulting from upper airways obstruction[1]. Sleep fragmentation, which is typical of OSA, results in

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excessive daytime sleepiness, fatigue, reduced vigilance, micro sleeps and decreased cognitive function[2]. The major risk factors for OSA are ageing, male gender and obesity, in particular central obesity[3][4]. Epidemiologic studies have shown that OSA risk is reduced in individuals who are physically active compared to those who are sedentary, the latter of which is known to be a risk factor for the development of obesity[5].

The information technology (IT) workforce represents a population at potentially high risk of undiagnosed OSA. In India, the IT industry is growing at a staggering pace and currently contributes more than 5% of the country's GDP[6]. This has created a new, increasingly

obese wealthy middle class of Indian IT professionals[7]. The sedentary nature of their work increases their risk of obesity and other health disorders with over 54% of the workforce in the IT sector reportedly afflicted with depression, severe headaches, obesity, chronic backache, spondylosis, diabetes and/or hypertension[8-10].

Several studies have reported an association between untreated OSA and decreased work productivity and increased work disability[11-16]. However it is difficult to generalise these findings to the Indian IT workforce given marked differences in methods used to assess OSA, work environment and the specific population studied[11-16]. Indeed, most previous studies have been undertaken on public sector workers, commercial drivers, or those referred to sleep laboratories in European and American populations. Therefore, the objective of this study was to determine the prevalence of OSA and its association with work disability in an IT workforce, an archetypical sedentary occupation.

Methods

Study Population

This cross sectional study recruited volunteers from an IT company in Chennai, India. Participants were required to be aged between 21-40 years and had worked for the previous 3 years in the IT industry. Volunteers were recruited from responses to an internal email from the company's Human Resource Department which detailed our visits to their campus. The study was approved by the Human Ethics Committee of Chettinad Hospital and Research Institute.

Questionnaires and anthropometric measurements

On the first visit all participants completed the Epworth sleepiness scale to assess the degree of daytime sleepiness[17], modified Berlin questionnaire to assess risk of sleep apnea[18] and a work disability questionnaire designed to detect recent and long term work disability and work duty modification that were attributable to an individual's sleep problems[15]. Anthropometric measures were also obtained and included Mallampati score as a simple estimate of oral patency[19], height, weight, neck, waist and hip circumference.

Home sleep study

Within two weeks of the first visit each participant underwent a home based overnight sleep study using an ApneaLink™ device (ResMed, Sydney, Australia). The ApneaLink™ is a type 4 (one to two channel) sleep monitoring device that simultaneously measures respired airflow via nasal prongs and oxygen saturation by pulse oximetry. Participants were instructed in using the device, specifically how to set themselves up at home and how to turn it on before sleep and off on waking. The device was collected the following day by the investigators for data downloading and analysis.

The ApneaLink software (version 8.0) was used to derive an apnea-hypopnea index (AHI) from the recorded data, defining an apnea as an 80% or greater decrease in airflow for at least 10 seconds and a hypopnea as 50% or greater decrease in airflow for at least 10 seconds or an airflow reduction of at least 30% that lasted 10 sec or longer with a corresponding decrease in oxygen desaturation of at least 4%. AHI was defined as the number of apneas/hypopneas per hour of the evaluation period. Data were only included for analysis if the total recording time was 5 h or longer.

Analysis

Participants were considered to have OSA if their AHI was e" 10 events/h[20]. Data from the groups with and without OSA were compared using t-tests for continuous variables (e.g. anthropometric measurements) and chi square tests for categorical variables (e.g. work disability measurements). All analyses were performed using SPSS version 17. A p-value of <0.05 was considered as significant and all data are presented as mean ± standard deviation.

Results

A total of 95 males volunteered for the study. A complete set of measurements including the overnight sleep study was obtained from 74 participants. The data from these 74 participants were used for all analyses.

The group overall (n=74) was comprised of participants with a mean age of 30±5 years, body mass index (BMI) of 26±5 kg/m^2 (15% were obese with a BMI>30 kg/m^2), neck circumference of 38±11 cm and waist-hip ratio of 0.96±0.08. Thirty percent (n=22) had OSA (AHI range between 11 – 110), 72% (n=53) were

habitual snorers, 45% (n=33) reported excessive daytime sleepiness (Epworth sleepiness scalee"10) and 54% (n=40) were classified as being at high risk for OSA based on their Berlin score (Table 1).

Table 1: Anthropometric measures and sleep characteristics of the male participants

	No OSA (AHI<10)	with OSA (AHIe"10)	P-Value
N	52	22	
Age, years	29 (5)	31 (5)	0.19
Anthropometric measurements			
BMI, kg/m2	25 (4)	28 (4)	0.003
Neck circumference, cm	37 (3)	40 (3)	0.001
Waist circumference, cm	91 (11)	101 (9)	0.001
Hip circumference, cm	96 (9)	99 (8)	0.16
Waist : Hip Ratio	0.95 (.07)	1.02 (.06)	0.001
Malampatti score	1.8 (0.9)	2.9 (0.9)	<0.001
Sleep Related Characteristics			
Epworth score	8.1 (4.1)	8.3 (4.3)	0.87
Berlin score	2.3 (0.8)	2.8 (0.4)	<0.001
Habitual snoring	61%	93%	0.02

All values under anthropometric measurements are shown as Mean (SD). P value for comparisons between groups with and without OSA Habitual snorers have been shown as a percentage and the significance value represents the results of a chi square analysis.

The OSA group had a significantly greater BMI, neck, waist and hip circumference, waist to hip ratio and Malampatti score when compared to the non-OSA group (Table 1). A significantly greater proportion of subjects with OSA were habitual snorers and at high risk for OSA based on their Berlin score (45 vs 81%, p=0.008) although there was no difference between the groups with regard to the mean Epworth score or the proportion of individuals reporting excessive daytime sleepiness (Epworth score >10, 38% vs 47%, p=0.51).

Compared to the group without OSA, a greater proportion of those with OSA reported increased work disability attributable to sleep problems. Specifically the group with OSA they reported decreased job effectiveness and more frequently changing their job/ employer (Table 2).

Table 2: Work disability in IT professionals with OSA

	No OSA	With OSA	P Value
Recent work disability			
Complete full missed work day	26%	7%	0.10
Partial missed work day	60%	40%	0.15
Fell asleep on the job	54%	40%	0.25
Decreased job effectiveness	67%	89%	0.05
Long term work duty modification			
Missed a promotion	13%	7%	0.46
Changed job schedule	26%	13%	0.26
Changed job duties	17%	21%	0.50
Changed job/employer	9%	33%	0.03
Nature of job			
Shift work	19%	40%	0.10
Reading printed text or display screens	37%	40%	0.53
Carrying out precise measurements/calculations	52%	67%	0.22
Interactive with the public by telephone or face to face	19%	20%	0.54
Supervisory role	60%	93%	0.01

Values given are column percentage for the work disability

P value obtained using Chi square test for the categorical variables of work disability have been given.

Discussion

This is the first study to report the prevalence of undiagnosed OSA in an IT workforce and to assess the relationship between the presence and absence of OSA and self-reported work disability in this population. The study showed that: (i) undiagnosed OSA was very common, being present in 30% of the workforce studied; and (ii) relative to individuals without OSA, those with OSA reported increased work disability, specifically decreased work efficiency and more frequent job change.

The prevalence estimate of OSA of 30% in the IT professionals in the current study is greater than the 9.6% prevalence of OSA reported from a metropolitan city in India[21]. The reasons for this difference are not clear by could relate to the very high rates of overweight and obesity in the present study, being 44% and 17%

respectively. These high obesity rates exceed proportions from five metropolitan cities in India that report a prevalence of overweight and obesity in individuals above 25 years of 33.5% and 6.8%, respectively[22].

The present study used an Apnealink device to define AHI. This simple portable monitoring device has been widely used to determine the presence of OSA[20]. It is notable that those with OSA in the present study were characterised as having several of the common risk factors for OSA including more habitual snoring and greater BMI, waist and neck circumference than those without OSA. The high proportion of individuals identified as at high risk of OSA from the Berlin questionnaire who were found to have Apnealink-diagnosed OSA suggests that the Berlin questionnaire might be a useful screening tool for OSA in the IT workforce. The lack of difference in daytime sleepiness between those with and without OSA may relates to an inappropriateness of questions contained in the ESS to the Indian population[23].

This study administered a previously published questionnaire to assess workforce disability attributable to sleep problems[15]. Frequency of recent work disability was quantified based on the incidence of missed complete or partial workdays due to sleeping problems and to low (<90%) self-rated job effectiveness on a 4 week cumulative index. Quantification of long term work duty modification was assessed based on the incidence of missed promotion, changes in job or job schedule which were specifically attributed to problems with sleep on a 5 year cumulative incidence. Individual component questions and composite outcomes (of any disability in either of the category) were used to define disability. Based on these rules the results of the present study show increased recent work disability and longer-term work duty modification in IT workers with OSA. Such a finding agrees with earlier reports of increased work disability among individuals with OSA working in occupations including professional drivers and Government employees[11-16] Our data also support the findings from previous studies showing that simple, self-reported symptoms of OSA syndrome such as snoring, cessation of breathing and excessive day time sleepiness are risk factors for both long term sick leave and permanent work disability[24].

It was interesting that the incidence of OSA was 93% in individuals who reported their role as being supervisory in nature. We considered whether the more sedentary nature of such work could predispose to obesity[5], a major risk factor for OSA. However such speculation was not supported by measurements of BMI, which were similar in supervisors with and without OSA (25 ± 4 vs 26 ± 3 kg/m^2, p=0.19). The software profession has been ranked as a particularly high stress job with 97% of employees claiming that their lives are stressful on a daily basis[25 26]. It is possible that stress, along with untreated OSA could contribute to the more frequent job changes observed among IT workers with OSA.

Conclusions

The current study shows that OSA is common amongst IT professionals and a potential risk factor for work disability with them. These findings suggest that screening for OSA in employees of software firms could be beneficial, both from a personal health and a productivity perspective.

Acknowledgement

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