A Cross Sectional Study on the Association of Co-Morbidities and Addictions with Sleep Disorders in Computer Professionals

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Abstract: ***Prolonged exposure to screen-based devices is known to cause sleep disturbances. Computer professionals area population with regular, prolonged screen exposure and hence have a higher probability of developing sleep disorders. This study was aimed to find the association of co-morbidities and addictions, with sleep disorders, in computer professionals of South India as there are no previous published data on sleep disorders in this population. In the study population, a history of hypertension (7.1% of participants) was found to be significantly associated (p-value <0.004) with prevalence of sleep disorders. Screening for life-style diseases and health awareness campaigns should be done in this group as they are an at-risk population.***

Keywords: Computer professionals, sleep disorders, Hypertension, co morbidities, addictions

1. Introduction

Screen based devices ranging from mobile phones to personal computers (PC) and television have come to be an indispensable part of our daily routine. They have significance in our lives, ranging from being a source of information and communication, to being a necessary part of many professions. American Academy of Paediatrics reports that 72% of children and 89% of adolescents have access to at least one screen-based device[1].With the advent of portable devices with internet connectivity and social networking, duration of exposure to screen-based devices has increased many fold[2]. Both extended duration of work and prolonged screen exposure is known to cause sleep, ocular and cardiovascular disorders[3],[4]. Computer professionals use screen-based devices for prolonged periods everyday as part of their profession [5]. With a high duration of screen exposure, based on previous study outcomes, they are at a high risk for developing sleep disorders. This study aims to find the association of sleep disorders with the existing comorbidities and addictions in computer professionals.

2. Material and methods

The study population was computer professionals in South India aged between 21 and 40 years. Sample size was calculated to be 178, assuming a prevalence of 50% sleep disorders in computer professionals. Data on socio-demographic variables and relevant medical history were collected using a structured proforma. Sleep Quality, and by extension, prevalence of sleep disorders, was assessed using the Pittsburgh Sleep Quality Index (PSQI). Both the questionnaire and PSQI were incorporated into a Google form and filledup by the participants online.

3. Results

Table 1: Co-morbid illnesses assessed to study association with sleep disorders in computer professionals.

S. No.	Variable	Frequency	Percentage
1	Diabetes	5	2.96
2	Thyroid dysfunction	15	8.88
3	Asthma	14	8.28
4	Recurrent sinusitis	22	13.02
5	Hypertension	12	7.10
6	Heart disease	00	00
7	Stroke	01	0.59
8	Head injury	04	2.37
9	Psychiatric illness	01	0.59
10	Night shift work	20	11.83
11	Regular alcohol intake	4	2.37
12	Cigarette/tobacco use	4	2.37
13	History of sleep disorders	17	10.06

Table 2 : Association of regular alcohol intake and cigarette/ tobacco use with sleep disorders

S. No.	Variable		Sleep disorder	
			Yes	No
1	Regular alcohol consumption	Yes	4	0
		No	103	62
2	Cigarette/Tobacco	Yes	4	0
		No	103	62

The Pearson's chi-square value for statistical association between alcohol or cigarette/ tobacco use, and sleep disorders couldn't be calculated because there were no cigarette smokers or those who reported alcohol consumption, in those who were not found to have sleep disorders. Fishers exact test also failed to find any significant association.

Table 3: Association of comorbid illnesses with sleep disorders detected by PSQI

Sl. No.	Variable		Sleep disorder		p-Value
			Yes	No	
1	Diabetes	Yes	3	2	>0.876
		No	104	60	
2	Hypertension	Yes	12	0	<0.004
		No	95	62	
3	Asthma	Yes	7	7	>0.280
		No	100	55	
4	Recurrent sinusitis	Yes	16	6	>0.326
		No	91	56	
5	Head injury	Yes	3	1	>0.624
		No	104	61	
6	Thyroid dysfunction	Yes	13	2	>0.922
		No	94	60	
7	History of sleep disorders	Yes	16	1	<0.005
		No	91	61	

4. Discussion

A history of sleep disorders was significantly associated with PSQI based assessment of sleep disorders (p-value <0.005). There was no significant association between diabetes, asthma, recurrent sinusitis, head injury, thyroid dysfunction, and sleep disorders (p-value >0.05). For the association between hypertension and sleep disorders, Pearson Chi-Square couldn't be calculated as there were no participants reporting hypertension among those who didn't have sleep disorders. Further, applying the Fishers exact test, a history of hypertension was found to have significant association (p-value <0.004) with presence of sleep disorders detected by PSQI.

Regular alcohol consumption was reported by only 2.37% of the participants. All of them were found to have sleep disorders by PSQI. But no statistically significant association could be found. Similarly, only 2.37% of participants reported using cigarettes and other tobacco products. All of them were found to have sleep disorders according to PSQI. It also did not have any statistically significant association. Previous studies have found both alcoholism and smoking or using tobacco products to be risk factors for poor sleep quality. A study by B A Phillips on cigarette smoking and sleep disturbance found that cigarette smokers were more likely to have sleep disorders as compared to non-smokers [6]. A critical review article by Ebrahim et al. in 2013 found that alcohol causes sleep disruption in the second half of sleep [7]. Another review on the relationship of alcohol and disturbed sleep concluded that alcohol consumption prior to sleep contributes significantly to sleep disturbances [8]. The lack of association in the present study population could be due to the small number of participants reporting regular alcohol consumption or cigarette and tobacco use, despite the high national average. Also, the most prevalent form of tobacco use in India is smokeless tobacco which is probably the reason behind very few reporting cigarettes use in our study group [9].

Among the study population, 2.96% of participants reported a history of diabetes. Of these 1.8% were found to have sleep disorders according to PSQI. There was no statistically significant association. The relationship between diabetes and sleep is well established [10, 11]. Prospective studies have shown that short sleep is a predictor for diabetes [12]. One in two people with Type II Diabetes have sleep problems due to unstable blood sugars [13]. The lack of statistical significance in present study group could be attributed to only 2.96% of the present study group reporting a history of diabetes, whereas the prevalence of diabetes in urban India is 19% [14]

Fifteen (8.88%) participants reported history of thyroid dysfunction. Of these 13 participants were found to have sleep disorders by PSQI. But there was no statistically significant association. Around 42 million people in India suffer from thyroid dysfunction [15]. Untreated thyroid dysfunction can affect a person's ability to achieve normal restful sleep [16]. A study among Grave's disease patients found 66.4% prevalence of sleep disorders [17]. Anxiety associated with hyperthyroidism and the cold intolerance and aches of hypothyroidism affect sleep quality [18, 19]

Among the participants, 12 (7.1%) reported having a history of hypertension. All 12 of them were found to have sleep disorders by PSQI. Bivariate analysis using Pearson Chi-Square couldn't be done as there were no participants with sleep disorders among those who did not have a history of hypertension. Fishers exact test showed a significant association between hypertension and sleep disorders (p-Value <0.004). Recent results from Great India Blood Pressure Survey found a 30.7% prevalence of hypertension in India. Of these, only 15.9% already knew they had hypertension [20]. Thus, around 50% of those who have hypertension are unaware of this. This probably accounts for the low prevalence of hypertension reported in our study population. Sleep Heart Health Study found that participants having reduced sleep duration had a higher frequency of hypertension [adjusted OR 1.66; 95% CI 1.35-2.04] [21]. A 2013 meta-analysis of prospective studies reports 20% increase in hypertension with habitual short sleep [22]. Among sleep disorders, Obstructive Sleep Apnea (OSA) is a known risk factor for developing hypertension. Experimental studies in mice have linked this to the generation of Reactive Oxygen Species (ROS) in Chronic Intermittent Hypoxia (CIH), leading to increased sympathetic activation and catecholamine release [23]. Recent studies have found the role of Hypoxia Inducible Factor (HIF) in the pathophysiology of development of hypertension in OSA. In OSA, CIH is found to cause increased levels of HIF -1α and decreased in levels of HIF - 2α in carotid body and brain [24]. Increased levels of HIF -1α causes HIF -1α dependent NADPH oxidase-2 synthesis which is a prooxidant. Decrease in levels of HIF-2α results in reduced activity of HIF-2α dependent Superoxide dismutase-2 synthesis which is an antioxidant [25, 26]. The resulting increase in ROS caused inhibition of Heme oxygenase-2 which in turn, through reduced Carbon monoxide (CO) levels, results in increased Hydrogen sulphide (H_2S) concentration in the carotid body [27, 28, 29] The increased H_2S inhibits calcium ion activated potassium channels resulting in depolarisation of the Type I glomus cells in carotid body. This causes increased release of excitatory neurotransmitters and thus chemoreceptor stimulation and catecholamine release, resulting in increased systemic blood pressure [29, 30]

None of the participants in the study population reported a history of heart disease. Heart diseases are increasingly occurring at younger ages in India with one- fourth of all acute myocardial infarction being reported in patients below 40 years of age [31]. UK Biobank study published in 2020 found that sleep disorders predispose an individual to developing cardiovascular diseases [32]. Hence the absence of participants with heart diseases in the study population may suggest lack of awareness and the need for screening this population for cardiovascular diseases [20].

In the present study, only one participant reported a history of stroke. This participant was found to have sleep disorder according to PSQI. But no statistically significant association could be found. A study on incidence of sleep disorders in patients with stroke showed that 78% of patients with acute stroke had sleep disorders [33]. Stroke is a leading cause of death and disability in India. An epidemiological study reports that the average minimum age for stroke in India is 40. But this age is much higher at 67 years in South Indian cities like Trivandrum. This higher age could be the reason for lesser stroke incidence in the present study group which is from South India [34].

Of the participants in the study group, 2.37% reported a history of head injuries. Of these, 1.8% were found to have sleep disorder, but without any statistically significant association. Sleep disorders occur in 30- 70% of individuals with Traumatic Brain Injury (TBI) [35]. Studies among army veterans with TBI showed they were 41% more likely to develop sleep disorders [36]. Some identified causes are, reduced orexin and melatonin secretion, and loss of histaminergic neurons in tuberomammillary nucleus and serotonergic neurons in dorsal raphe nucleus [37, 38, 39, 40]

Only one participant had a history of psychiatric illness. The individual has sleep disorder according to PSQI, but no statistical significance could be found. It has been long known that sleep disturbances are part of the symptoms of psychiatric illness. The presence of sleep disturbance is part of the diagnostic criteria for many psychiatric illnesses and treatment of psychiatric illnesses often helps the patient sleep better. Thus, it’s a bidirectional relationship [41]. The lack of statistically significant association in our study may be attributed to the low prevalence in the study group.

In the present study population, 14 participants (8.28%) reported a history of asthma. Of these, seven were found to have sleep disorders by PSQI. But no statistically significant association could be found between the history of asthma and sleep disorders. The prevalence of self-reported asthma among adults in South India (2005-2006) was found to be 1.2 to 2.1% [42]. Asthmatics have been known to have more disturbances to sleep quality including, difficulty inducing sleep, sleep fragmentation, early morning awakenings and daytime sleepiness [43].

A history of recurrent sinusitis was reported by 22 participants (13.02%). Sixteen of these were found to have sleep disorders by PSQI. No statistically significant association was found between a history of recurrent sinusitis and sleep disorders. Patients with chronic rhinosinusitis are known to have significantly higher proportion of sleep disruptions (60 to 75%) than general population [44].

5. Conclusions

- The presence of hypertension was found to be significantly associated with prevalence of sleep disorders among computer professionals.
- Screening for lifestyle diseases should be done in this group as they are an at-risk population.
- Healthawarenesscampaignsregardinglifestylechangesneedtobedoneamongcomputer professionals.
- Computer professionals and their partners need to be made aware of the need for good sleep hygiene and the consequences of inadequate sleep.
- Further studies should be done to evaluate the impact of individual risk factors on sleep quality among computer professionals in India and intervention planned accordingly.

6. Limitations

- Less number of participants reporting lifestyle diseases that are known to have a higher population prevalence.
- Considering the national average, the reduced number of participants reporting alcohol and tobacco use suggests reluctance to reveal usage of alcohol and tobacco

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