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Sleep pattern, sleep problems and comorbidities among resident doctors at a tertiary care institution in India: a cross sectional study

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ABSTRACT

Background: Sleep problems are a major concern in population working under stress such as resident doctors. Sleep has many health benefits; sleep problems are linked with short and long term adverse health outcomes. Aim was to study sleep pattern, problems and comorbidities among resident doctors.

Methods: A cross-sectional study design with a pre-validated sleep assessment proforma was used to collect information on socio-demographics, sleep pattern, sleep problems and comorbidities from 428 resident doctors found eligible for the study.

Results: 350 subjects returned the filled proforma (82% response rate). Mean daily sleep hours were 6.21 (SD, 1.39) and work hours 12.77 (SD, 3.63). Sleep time was night in 64.6%, day in 12%, and both in 23.4%. Monthly average of 5.8 night shifts and 2.03 duty offs were found. Visual analogue scale (0-10) mean scores for sleepiness and tiredness were 4.41 (SD, 2.55; 95% CI, 4.14-4.68; P<0.01) and 4.73 (SD, 2.62; 95% CI, 4.45-5.00; P<0.01) respectively. Presence of different symptoms related to sleep problems ranged from 7 to 26% and various problems interfering with sleep ranged from 10 to 25%. Comorbidities such as allergy (29.4%), jerky legs (24.3%), sinus infections (22.8%), restless leg syndrome (16.3%), snoring (8.3%), asthma/lung diseases (5.8%), chronic diseases (3.4%), severe snoring disturbing others (1.8%), and obstructive sleep apnoea (0.9%) were present.

Conclusions: Sleep problems were highly prevalent among resident doctors. The resident doctors were sleep-deprived, overworked, tired, excessively sleepy, and had significant presence of factors affecting circadian rhythm and sleep fragmentation. Various comorbidities were also present with varying prevalence.

Keywords: Sleep problems, Work stress, Resident doctors, Shift work, Sleep comorbidities

INTRODUCTION

Sleep problems are a major concern for public health professionals, emerging rapidly in recent times. Normal sleep in terms of quantity and quality is essential for optimal day to day functioning. It is essential to maintain certain sleep hygiene behaviours and practices, in addition to good bodily health, to enjoy good quantity and quality of sleep.

Sleep quality and quantity are affected by a large number of factors as documented by innumerable studies. The deranged sleep pattern and sleep deprivation lead to sleep debt, which further results in alterations of normal sleep architecture.² Consequent changes in the homeostatic molecular mechanisms involving circadian systems at hypothalamus-pituitary axis result in adverse effects on health and wellbeing.³⁻⁵

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Sleep problems result from extrinsic as well as intrinsic factors. Many studies have established clear links with sleep hygiene practices, exercise, stress, alcohol, coffee, occupational high job demands, long work hours, shift work, and exposure to video games, computer/smartphone screens, etc.⁶⁻⁹ Certain internal factors such as obesity, neurological diseases, chronic illnesses, depression, anxiety disorders, and restless leg syndrome also contribute to sleep problems.¹⁰ Sleep disorders are commonly associated with major medical problems such as chronic pain, cardiovascular disease, dementias, metabolic disorders, gastrointestinal disorders, and so on.¹⁰⁻¹⁵

Many studies have documented the occurrence of sleep problems with medical comorbidities. Since sleep problems are often found with other morbidities, it is essential for medical professionals to look for complete medical history, physical findings and a proper evaluation of the physical health in persons suffering from sleep problems. Conversely, while dealing with persons suffering from medical conditions or chronic problems, one must always look for the co-existence of any sleep problem. ^{12,14,15}

When there are associated comorbidities, treating one condition and leaving the other untreated may not provide lasting solutions or relief to the individual. Also, addressing often undiagnosed sleep problems in patients with chronic medical conditions would improve quality of life, course and prognosis of the medical condition. It also would reduce the need for repeated visits to health system facilities thus reducing the health care burden. ^{16,17}

Sleep problems among health care professionals is a major concern area, This is because there is an overwhelming amount of evidence which links the impact of sleep problems with performance, cognition, memory, learning, decision making and also medical errors, accidents and quality of patient care. ¹⁸ Also, long term studies have clearly documented the association of sleep problems with diabetes, cardiovascular diseases, strokes and cancer. ¹⁹⁻²¹ The shift work with circadian disruption or chronodisruption has been classified as a probable human carcinogen (group 2A) by the International Agency for Research on Cancer (IARC) in 2007. Chronodisruption is the chronic disturbances or disruptions of timely sequenced circadian rhythms. ²²

Studies on sleep problems are limited from India. Few studies have documented very high prevalence of excessive daytime sleepiness (EDS) among medical students, resident doctors, college students, older adults, healthy pre-schoolers and school going children. Very few studies have documented comorbid conditions with sleep problems from India. 11,26

In this context, it is necessary to study sleep pattern, problems and comorbidities extensively in countries like India where epidemiological transitions are occurring at a

rapid pace. This would generate evidences peculiar to the existing socioeconomic and cultural contexts of India. It would help the public health professionals and clinicians to further plan interventions at various levels.

METHODS

This study included all medical residents enrolled in clinical, pre-clinical and para-clinical departments of a Tertiary Care Medical Institution of India. The list of all the residents was obtained from the concerned authorities with a prior approval from an IRB.

A cross sectional descriptive study was designed in which all participants were administered with pre-validated sleep assessment proforma. The information on sociodemographics and sleep-related factors was collected using the Sleep Assessment Proforma.³¹

There were 430 residents enrolled at the time of assessment. Residents who were pregnant, sick, or admitted to the hospital (n=2) were excluded from the study and the remaining 428 were included in the study. The study population was a uniform homogenous group with regard to age as most of the physicians were in mid and late 20's and they were consisted of resident physicians from all parts of India.

The study subjects were visited at their work place and a suitable appointment was taken from them for the initial interview. Consent was obtained after explaining the purpose of the study. After an initial brief interview, socio demographic data was collected followed by self-administration of sleep assessment proforma which took about 20 minutes. Clarifications were made to the study participants on various aspects of the study tool. The collection of the data was conducted mainly in the afternoons, post lunch sessions, and in the early evening.

Most residents (70%) completed the assessment forms during their free time. Subjects asked for 2 days to 2-4 weeks of time for completing the forms. The phone numbers and e-mail addresses of these residents were collected. They also fixed a probable place for returning the filled forms which was noted and followed. Residents were later contacted for clarifications in almost all cases where forms were incomplete.

The sleep assessment proforma had been in use and were validated by prior studies. The face validity for the tools was assessed by the combined opinion of about 25-30 experts (faculty, senior residents), colleagues prior to data collection. The tool was pretested on five outgoing residents prior to data collection for feedback on potentially confusing and difficult questions and overlapping categories of the tool. A pilot study was conducted on 10-15 residents of the outgoing batch in the hospital setting to test the feasibility of the survey methodology. The time taken to complete questionnaire was noted. Necessary changes in the tools/survey plan

were executed as per the observations during the pilot study.

The data was analyzed using SPS® statistical package 10.00. The statistical tests used were percentage, mean, S.D., χ^2 test, t- test, ANOVA. The results of analysis were tabulated and presented with appropriate statistical measures.

RESULTS

Table 1 shows the distribution of socio-demographic factors among study participants. In this study, 80.6% of the participants were male and 19.4% were female.

Among them 26.3% were married and 73.3% were unmarried. The tea/coffee intake of more than 2 cups was reported by 34.3%, and 42.3% consumed coffee or tea within 4 hours of bedtime. Smoking tobacco was present in 8% and 6.1% smoked within 4 hours of bedtime. Alcohol intake was reported by 21.9% and intake within 4 hours by 11.2%. Physical activity in addition to work was not present in 60.7% and about 9% had only less than 30 minutes of physical activity other than routine work. Only about 30% had good additional physical activity. Body mass index (BMI) was found to be normal in 66.9%, obesity range in 24.9% and lower range in 5.1% of the study participants. 86.6% worked in clinical departments and 13.4% in non-clinical departments.

Table 1: Socio demographic and lifestyle profile of study participants (N=350).

Socio-demographic factors	Categories	N	%
Sex	Male	282	80.6
	Female	68	19.4
Marital status	Married	92	26.3
	Not married	258	73.7
Coffee-tea (cups/day)	0-2 cups	229	65.4
	>2 cups	120	34.3
Coffee-tea within 4 hours before bed time	Yes	148	42.3
	No	194	55.4
Tobacco smoking	Yes	28	8.0
	No	321	91.7
Alcohol intake	Yes	76	21.9
	No	271	78.1
Alcohol intake within 4 hours of bedtime	Yes	38	11.2
	No	302	88.8
Smoking within 4 hours of bedtime	Yes	21	6.1
	No	325	93.9
Physical activity frequency in addition to work in a	nil	212	60.7
week	1-3 days	107	30.7
	>4 days	30	8.6
Physical activity duration in addition to work in a	<30 min	241	69.3
week	30 min to 2 hours	81	23.3
	>2 hours	26	7.5
BMI	Low	18	5.1
	Normal	234	66.9
	Obese	87	24.9
Residency year	1 st	136	38.8
	2 nd	99	28.2
	3 rd	115	32.8
Department	Clinical	303	86.6
	Non-clinical	47	13.4

Table 2 shows the range, mean, 95% CI, 2-sided p values of work and sleep hours in the recent times among study participants. Work and sleep hour means in last 1 week were 83.05, 46.16 respectively; the means in last one day were 12.77 and 6.21 respectively. 95% CI were within narrow range and single sample t test for mean ruled out the role of chance in obtaining the estimates.

Table 3 shows the time of sleep. 12% slept day time, 64.6% night time and 23.4% during both day and night time in the previous month. The residents who responded so had unstable floatation type of shift work. 15.7% reported that they had to wake up from sleep in between either to attend work or due to some other factors.

Table 2: Recent work and sleep hours among study participants (N=350).

Variables	Min.	Max.	Mean	S.D	P (2 tailed)	95% CI
Work hours in last one day	3.00	32.00	12.77	3.63	0.000	12.39-13.15
Work hours in last one week	30.00	144.00	83.05	22.70	0.000	80.66-85.43
Sleep hours in last one day	1.00	12.00	6.21	1.39	0.000	6.06-6.35
Sleep hours in last one week	20.00	110.00	46.16	11.77	0.000	44.92-47.39

Table 3: Sleep time and interruption in last month among study participants (N=350).

Variables	Category	N	%
Sleep pattern (time) in last month	Day time	42	12.0
	Night time	226	64.6
	Both	82	23.4
Wake up in between sleep	Yes	55	15.7
	No	295	84.3

Table 4: Shift work related factors in previous month among study subjects (N=350).

Shift work related parameter	N	Mean	S.D	S.E	95% CI	P (2 tailed)
Night shifts in the previous month	341	5.80	6.49	0.35	5.10-6.49	0.000
Duty offs in the previous month	346	2.03	2.62	0.14	1.75-2.30	0.000

Table 5: Reported problems interfering with sleep among study participants (N=350).

Problem interfering with sleep	N	%
Needing a drink of water	88	25.14
Indigestion/reflux	60	17.14
Needing to use the bathroom	57	16.28
Racing thoughts/can't turn off your mind	37	10.5

Table 4 shows that the mean number of night shifts was 5.8 and duty offs were 2.03 among study participants. The means were statistically significant. The 95% CI are also shown.

Table 5 shows the reported presence of problems among study participants, which are known to often disturb their

continuity of sleep. A total of 88 (25.14%) respondents reported that their sleep was disturbed by the need to drink a glass of water, 60 (17.14%) reported indigestion/reflux, 57 (16.2%) needing to use bathroom, and 37 (10.5%) reported the problem of racing thoughts/anxiety/can't turn off mind as the main complaint interfering with their sleep.

Table 6: Visual analog scale responses on sleepiness and tiredness by subjects (N=350).

Question	Min.	Max.	Mean (SD)	S.E	P (2-tailed)	95% CI
How sleepy are you today?	0 (not sleepy)	10 (extremely sleepy)	4.41 (2.55)	0.13	0.000	4.14-4.68
How tired are you today?	0 (not tired)	10 (extremely tired)	4.73 (2.62)	0.14	0.000	4.45-5.00

^{*}The question asked was 'On a scale of 0 to 10, how SLEEPY are you today?', 'On a scale of 0 to 10, how TIRED are you today?'.

Table 7: Co-symptoms related to sleep problems among study participants (N=350).

Symptom	N	0/0
Feeling anxious	91	26
Wake up with dry mouth	82	23
Difficulty concentrating	77	22
Feeling depressed	76	22
Difficulty with memory	47	13
Morning headaches	40	11
Disturbing dreams and nightmares	26	7

Table 8: Comorbid conditions reported by the study participants (N=350).

Comorbid conditions	Responses	N (%)
	Yes	29 (8.3)
Snoring	No	263 (75.1)
	Don't know	58 (16.6)
	Yes	6 (1.8)
Others moved because of snoring	No	292 (85.4)
	Don't know	44 (12.9)
	Yes	3 (0.9)
Obstructive sleep apnoea	No	324 (93.1)
	Don't know	21 (6.0)
Jerking legs during sleep	Yes	84 (24.3)
	No	262 (75.7)
Restless leg sleep problem	Yes	57 (16.3)
	No	292 (83.7)
H/o Allergy	Yes	102 (29.4)
n/o Allergy	No	245 (70.6)
H/o Tonsil/adenoid removal	Yes	12 (3.4)
H/O TOHSH/adenoid Tellioval	No	336 (96.6)
A othera /lung disaasa	Yes	20 (5.8)
Asthma/lung disease	No	328 (94.2)
Sinus infection in last 2 years	Yes	79 (22.8)
Sinus infection in last 3 years	No	268 (77.2)
History of sinus suppories	Yes	6 (1.7)
History of sinus surgeries	No	341 (98.3)
Chronic diseases	Yes	12(3.4)
Cironic diseases	No	336(96.6)

Table 6 shows the responses made by the study participants on a visual analogue scale (VAS) to assess their sleepiness and tiredness. The questions asked were 'On a scale of 0 to 10, how sleepy are you today?' and 'On a scale of 0 to 10, how tired are you today? The mean scores were 4.41 (SD, 2.33) and 4.73 (SD, 2.62) respectively. The p values were statistically significant and 95% CI were also within a narrow range.

Table 7 shows the reported symptoms associated with sleep problems. 91 (26%) respondents reported anxiety, 82 (23.4%) reported waking up with dry mouth, 77 (22%) reported difficulty in concentrating, 76 (21.7%) reported feeling depressed, 47 (13.4%) with memory difficulties, 40 (11.4%) with morning headaches and 26 (7.4%) reported disturbing dreams or nightmares.

Table 8 shows the presence of comorbid conditions among respondents. Snoring was reported by 29 (8.3%) of the respondents, 58 (16.6%) did not know whether they snore. Six (1.8%) reported that others moved because of their snoring. Three respondents (0.9%) reported that they suffer from OSA. Jerking legs and abnormal sensations in legs during sleep were reported by 84 (24.3%) of the respondents; 57 (16.3%) reported that they have restless leg sleep problem. 29.4% reported problems of allergy, 3.4% had tonsil or adenoid problems. 22.8% had sinus infection in last 3 years and

5.8% has asthma or lung diseases. 1.7% had history of sinus surgeries and 3.4% had chronic illnesses.

DISCUSSION

This cross-sectional descriptive study conducted among resident doctors has shown that the sociodemographic profile reflects changing lifestyles that include behaviours which predispose individuals to develop sleep problems due to compromised sleep quantity and quality. The scoring on VAS by the study participants translates to about 44.1% excessive daytime sleepiness and 47.3% tiredness which is very well explained by the presence of risk factors in sociodemographic and work profile of these resident doctors. A high prevalence of factors such as coffee, alcohol, and lack of physical exercise are shown to be associated with poor sleep hygiene, poor sleep quality and high occurrence of excessive daytime sleepiness by previous studies. 8,27,28,33-35

Sleep quantity in these doctors appears to be compromised mainly because of their work pattern. Mean daily sleep hours were only 6.21 and weekly sleep hours were 46.16. Plenty of literature suggests about 7 to 8 hours of sleep is necessary for young adults. There is a possibility of chronic sleep deprivation among these resident doctors with accumulating sleep debt. Sleep hours of residents were less mainly due to long work

hours, which are 12.77 and 83.04 hours per day and week respectively. Clearly, work stress and sleep debt are affecting the sleep among the study participants, similar to the findings from many previous studies. 2,18,37

Another dimension to the high burden of sleep problems is the shift work which is of floating type in our study. The subjects worked an average of 5.8 night shifts a month with only 2.03 duty offs, which is not even half of the number of night shifts. The patterns in night shift work resulted in 64.6% sleeping at night time, 12% day time and 23.4% had no fixed pattern (slept both day and night time). Also, about 15% reported sleep disturbance due to night calls. This indicates that about one fourth of subjects were susceptible to develop circadian rhythm disturbances due to shift work and hence at risk of developing sleep problems and suffer adverse health effects, which findings are consistent with evidence from a large number of previous studies. 5,18,38

The presence of non-work related factors which disturbed sleep of study participants such as need to drink water, need to empty bladder, acidity/gastric reflux, anxiety, racing thoughts etc., were mostly related to sleep hygiene and/or preparations needed to be made adequately before going to bed.^{8,9} Emptying bladder before going to bed, sleeping in a room at comfortable temperature, maintaining good hydration, relaxing techniques to slow down the thoughts, and dietary habits which prevent gastric acidity and reflux are some of the factors which facilitate good sleep as evidenced in previous studies.^{8,9,39} Many studies have emphasised the role of sleep hygiene practices and behavioural trainings in the prevention of sleep problems. 39-44

The presence of symptoms such as anxiety, feeling depressed, memory difficulties, concentration difficulties, headaches, nightmares in high proportion of study subjects indicates the possibility of sleep problems affecting the neuro-psychological functions of brain. Some of these factors such as anxiety and depression have bidirectional relationship, such that they in turn affect sleep quality and quantity resulting in a vicious cycle.^{36,45} Waking up with dry mouth probably indicates mouth breathing which may be due to problems with airway while sleeping. These factors may be thought of as comorbid symptoms occurring with sleep disorders which need medical attention along with sleep problems, or may be clues towards underlying sleep problems. 12-14,36 Awareness generation among health professionals regarding such factors is necessary.¹⁴

The presence of various comorbid illnesses among study participants ranged from 1 to 30%. Predominantly the diseases related respiratory system have close links with sleep problems as documented in previous studies.³⁶ Snoring of various degrees were reported by study participants; the most severe form, obstructive sleep apnoea, was present in about one percent participants. The problem of jerky legs and pain in legs was reported

by about one fourth which signifies the common occurrence of this relatively unknown problem; studies have established restless leg syndrome as a type of sleep disorder.46

The presence of allergies, asthma, lung diseases, adenoids, tonsils also should raise suspicion in the minds of health professionals to look for sleep problems. 47,48 The presence of chronic diseases among study participants was low mainly due to their age profile and hence their contribution to the higher presence of excessive sleepiness appears to be low. It also appears to be true for other comorbid conditions reported by the subjects. However, many sleep studies in other age group subjects have documented the presence of higher levels of comorbidities. 49,50 This again reaffirms the need for a holistic and multidimensional approach when dealing with sleep problems.

CONCLUSION

Sleep problems affect everyone in all age groups, regions, societies, occupational settings and health profiles, depending on the presence of risk factors. The risk factors for sleep problems are increasingly being identified all over the world. There is a need to detect sleep problems early in high risk groups such as resident doctors. The availability of simple, reliable and valid tools and also the knowledge about associated comorbid conditions would help in identifying sleep problems with better sensitivity. It is essential to address both sleep problems and comorbid conditions simultaneously to achieve lasting relief and benefits to the affected individuals.

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