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Sleep and Exercise among Young Doctors in a Tertiary Care Hospital in India: A Pilot Cross-Sectional Study

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Background: Limited information is available on the sleep and propensity for daytime sleepiness in young medical doctors of India.

Methods: The 2-week self-reported data surrounding sleep and exercise habits, and the Epworth sleepiness scale (ESS) score obtained from volunteering doctors of a tertiary care hospital in India, were summarized as median (Q1-Q3). Comparisons with Mann-Whitney U test and correlations with Spearman's rank correlation were done.

Results: Forty-seven doctors (28 [26-33] years, 16 males) reported a total sleep duration (TSD) of 6.3 (6-6.7) hours, sleep latency of 9 (5.1-15.8) minutes, and ESS score of 8 (5-10). The number of days (out of 14) when the subjective feeling of 'refreshed', 'somewhat refreshed', and 'fatigued' was experienced was respectively 6 (2-9), 5 (3-8), and 1 (0-4). Junior-level doctors experienced more days of 'fatigue' than senior-level doctors (3 [0-4.3], 0 [0-0]; p = 0.002). Doctors who did not exercise reported greater days of fatigue than those who exercised (2 [0-4.8], 0 [0-2]; p = 0.047).

Conclusions: The young doctors of our study slept less than the recommended amount of 7 hours by the American Academy of Sleep Medicine. Their short sleep latency and normal propensity for daytime sleepiness, though encouraging, may be an effect of insufficient sleep and mentally alerting daytime schedule respectively. Notably, we found a positive association between exercise habits and subjective restoration following sleep in our study population. The sleep requirements and sleep structure among Indians are yet to be established. Our findings add to the data on sleep in the Indian context.

Key Words: Total sleep duration, Sleep latency, Daytime sleepiness, Medical doctors, India

INTRODUCTION

Health professionals are vulnerable to sleep deprivation. Shift work and uncontrolled long working hours contribute to this [1,2]. The workload of medical doctors in India is huge, considering the lesser number of doctors in comparison to the population [3]. This can compound the problem of insufficient sleep in them. Younger doctors have the additional risk of volitional restriction of sleep due to academic pressures and lifestyle factors such as being engaged in late-night recreational activities. The American Academy of Sleep Medicine and Sleep Research Society recommends 7 hours of sleep for adults per night on a regular basis for ideal health and states that more than 9 hours of sleep may be apt for young adults [4].

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Do young medical doctors of India get the recommended hours of sleep? What is the extent of daytime sleepiness experienced by them? To address these questions, we analyzed the self-reported data surrounding daily sleep, collected from young medical doctors of a tertiary care hospital in south India as part of the survey prior to enrolment in a sleep deprivation study (unpublished data). The subjective experience of whether sleep revitalizes them, and their daily exercise habits were obtained in addition.

MATERIALS AND METHODS

As part of the recruitment procedure into a sleep deprivation study, which was approved by the institutional review board, medical doctors aged 23-40 years of Christian Medical College, Vellore, India, who responded to a flyer advertising for volunteers for the study, after informed consent, maintained a diary of sleep and related events over 2 weeks and answered the Epworth Sleepiness Scale (ESS), a questionnaire to assess inclination for daytime sleepiness [5]. Subjects with pre-existing sleep disorders, depression, anxiety, mood disorders, and on medications that affect sleep were excluded. Night shift duty in the past 3 months and crossing of time zones of 2 or more hours in the past one month were other exclusion criteria applied.

Participants entered information regarding whether they exercised during the day, including the duration of exercise, into the sleep diary, just before bedtime. On waking up, information regarding the time when subjects went to bed and got up from bed, time taken to fall asleep (sleep latency), and the extent to which the subject felt refreshed/fatigued on waking up was logged daily for 14 continuous days. From the output of the sleep diary, the 2-week average of total sleep duration in hours, the sleep latency in minutes, and the number of days out of 14 days when the subjective feeling of 'refreshed', 'somewhat refreshed', and 'fatigued' was experienced was computed and analyzed in this study. The ESS gives a summated score ranging from 0-24. Fixed ranges from 0-5, 6-10, 11-12, 13-15, and 16-24 correspond to increasing grades of the propensity for daytime sleepiness from 'lower normal', 'higher normal', 'mild excessive', 'moderate excessive', and 'severe excessive' daytime sleepiness.

As the sleep structure varies with the sex of an individual [6] we compared the parameters between the male and female doctors in our study. Although all the participants were in the age group of young adults, there was a difference in their professional level. Hence, we compartmentalized the participating interns, postgraduate registrars and senior residents into the group of junior-level doctors and the consultants into the group of senior-level doctors and compared the data across the 2 groups. Considering the reports that exercise influence sleep and enhance deep slow wave sleep [7-9], we classified our study population into an 'exercise' group and 'non-exercise' group, based on the 2-week self-reported data on the performance and duration of daily exercise, and compared all parameters between the groups.

The hallmark feature of insufficient sleep is excessive daytime sleepiness [10,11]. Hence, we studied the relationship between total sleep duration and ESS score to see if there was any correlation between the two in our subjects, including in each sub-group. Further, to see if the feeling of 'fatigue' on waking up can be attributed to insufficient sleep, we investigated whether the number of days of feeling of 'fatigue' correlated with the total sleep duration in all the subjects, and in each sub-group independently.

Most of the continuous variables were non-normally distributed and hence data were summarized as median (Q1-Q3); categorical variables were summarized with frequencies and percentages. All sub-group comparisons were done using the Mann-Whitney U test. Correlations between parameters were analyzed using Spearman's rank correlation coefficient. A p-value < 0.05 was considered significant.

RESULTS

Out of 60 medical professionals who volunteered to maintain the 2-week sleep diary and answer the ESS questionnaire, 47 completed the tasks. All descriptive and analytical statistics were performed on the data of these 47 participants. Lack of time in the mornings and forgetfulness were the common reasons cited by the 13 subjects who did not complete the sleep diary.

The demographics, exercise habits, sleep characteristics, subjective feeling of restoration on waking up, and daytime

sleepiness of the participants are given in Table 1. Of the 47 participants, 13 (27.7%) reported performing a minimum duration of 150 minutes of exercise per week and were classified into the 'exercise' group. The subjects in the 'non-exercise' group did not report performing any exercise. The overall total sleep duration of the young medical doctors was 6.3 (6-6.7) hours and sleep latency was 9 (5.1-15.8) minutes. The overall ESS was 8 (5-10), indicating that daytime sleepiness was in the normal range for 75% of the participants. On waking up from sleep, participants reported feeling 'refreshed' 41.8% of the days, 'somewhat refreshed' 42% of the days, and 'fatigued' 16.2% of the days, over the period of 14 days.

No significant differences in the total sleep duration, sleep latency, subjective feeling on waking up, and daytime sleepiness were seen between the male and female doctors (Table 2). Junior-level doctors reported the feeling of 'fatigue' for significantly more number of days than senior-level doctors (Table 2). Similarly, the doctors in the 'non-exercise' group reported feeling of 'fatigue' for significantly greater number of days than the doctors in the 'exercise' group (Table 2). None of the other parameters

Table 1. Demographics, exercise habits, sleep characteristics, and propensity for daytime sleepiness of participants (N = 47)

Variable	Median (Q1-Q3) or N (%)
Age (years)	28 (26-33)
Sex	
Male	16 (34%)
Female	31 (66%)
Exercise habits	
Exercise group	13 (27.7%)
Non-exercise group	34 (72.3%)
Professional level	
Junior	36 (76.6%)
Senior	11 (23.4%)
TSD (hours)	6.3 (6.0-6.7)
SL (minutes)	9 (5.1-15.8)
Subjective feeling on waking up (number of days out of 14)	
'refreshed'	6 (2-9)
'somewhat refreshed'	5 (3-8)
'fatigued'	1 (0-4)
ESS	8 (5-10)

TSD: total sleep duration, SL: sleep latency, ESS: Epworth sleepiness scale.

Table 2. Sub-group comparison based on sex, professional level, and exercise habits of doctors (N = 47)

Variables	Sex			Professional level			Exercise habits		
	Male (n = 16) Median (Q1-Q3)	Female (n = 31) Median (Q1-Q3)	p-value	Junior (n = 36) Median (Q1-Q3)	Senior (n = 11) Median (Q1-Q3)	p-value	Exercise group (n = 13) Median (Q1-Q3)	Non-exercise group (n = 34) Median (Q1-Q3)	p-value
TSD (hours)	6.2 (5.9-6.5)	6.3 (6.0-6.9)	0.432	6.3 (6.0-6.7)	6.3 (5.8-6.8)	0.890	6.2 (5.9-6.6)	6.3 (6.0-6.7)	0.784
SL (minutes)	7.3 (4.6-15.0)	10 (5.5-16.6)	0.393	8.2 (5.0-15.4)	12.1 (7.9-16.0)	0.352	6.4 (5.4-15.0)	9.5 (5.0-16.1)	0.924
Subjective feeling on waking up (number of days out of 14)									
'refreshed'	4 (0-9)	6 (3-9)	0.372	6 (3.0-9.3)	8 (1-8)	0.82	8 (4-12)	4.5 (1.3-8.8)	0.117
'somewhat refreshed'	7 (3.5-11.3)	4 (3.0-6.5)	0.146	4.5 (3.0-7.3)	6 (4.5-13.0)	0.082	4 (2-6)	5 (3.3-8.0)	0.519
'fatigued'	0 (0.0-2.3)	2 (0-4)	0.168	3 (0.0-4.3)	0 (0 -0)	0.002*	0 (0-2)	2 (0.0-4.8)	0.047*
ESS	8 (5.8-9.3)	8 (4-10)	0.684	8 (6-10)	6 (4.5-13.0)	0.889	8 (4-11)	8 (6.0-9.8)	0.895

TSD: total sleep duration, SL: sleep latency, ESS: Epworth sleepiness scale.
*p-value < 0.05, Mann-Whitney U test.

Table 3. Correlation of TSD with ESS and the number of days (out of 14) of feeling of fatigue on waking up

Correlation of TSD with	All subjects (n = 47)		Males (n = 16)		Females (n = 31)		Junior-level (n = 36)		Senior-level (n = 11)		Exercise group (n = 13)		Non-exercise group (n = 34)	
	r-value	p-value	r-value	p-value	r-value	p-value	r-value	p-value	r-value	p-value	r-value	p-value	r-value	p-value
ESS	−0.257	0.081	−0.363	0.168	−0.145	0.437	−0.237	0.164	−0.231	0.494	−0.076	0.805	−0.335	0.039*
Number of days of feeling of fatigue on waking up	−0.242	0.101	0.122	0.653	−0.454	0.010*	−0.310	0.065	−0.149	0.663	−0.376	0.205	−0.256	0.144

TSD: total sleep duration, ESS: Epworth sleepiness scale, r-value: Spearman's rho correlation coefficient.
*p-values < 0.05, Spearman's rank correlation coefficient test.

were different between the groups when considering either the professional level or the exercise habits of the doctors of our study.

A small, nevertheless significant, negative correlation was seen in the female doctors between their total sleep duration and the number of days they reported the feeling of fatigue ($r = -0.454$, $p = 0.01$) (Table 3). Similarly, the ESS score significantly correlated negatively, but to a small extent, with the total sleep duration in the doctors who did not exercise ($r = -0.335$, $p = 0.039$).

DISCUSSION

We found that the young medical doctors of our tertiary care hospital were sleeping for a lesser time per night (6.3 [6.0-6.7] hours) than the 7 hours or more, recommended by the American Academy of Sleep Medicine and Sleep Research Society [4]. However, the sleep latency was short and on most of the days, the participants woke up feeling either 'refreshed' or 'somewhat refreshed' and reported the feeling of 'fatigue' only 16.3% of the time. Further, only 25% of the participants reported daytime sleepiness in the excessive range. This could be attributed to the fact that the intense work schedule of the young doctors precludes them from experiencing—and therefore even imagining—any of the soporific daytime situations described in the ESS questionnaire. The short sleep latency could point to chronic insufficient sleep and accumulated sleep debt, as has been reported previously [12].

These findings related to sleep in young doctors in the Indian scenario require attention, as the excessive workload compounded by the inadequate sleep in them can be a threat to the health of both the physician and the patient. Prolonged sleep restriction has been reported to reduce the cognitive and clinical performance of physicians [13-15]. More dangerously, the chronically sleep-deprived tend to underestimate their impairment [16], which can have serious repercussions in the scenario of patient care by a physician with cumulative sleep debt. Further, sleep-deprived doctors are vulnerable to the well-described long-term consequences of chronic sleep loss that include obesity, type II diabetes mellitus, and increased cardiovascular diseases [17-19]. However, little has been reported on the sleep of

Indian doctors. We found that young adult male and female doctors, working either at the junior or senior levels professionally, were sleeping less than the desired amount of 7-9 hrs for their age group, which is a cause for concern. Of the 47 participants, 37 (78.7%) reported a 2-week average of less than 7 hours of sleep per night. It is comforting however that they recorded a short sleep latency, subjectively experienced more restorative sleep, and revealed daytime sleepiness mostly in the normal range.

We also found that the feeling of 'fatigue' on waking up after sleep was experienced more by junior-level than senior-level doctors, despite not being on shift work or continuous night duty, supporting the need for longer hours of sleep in them. Inadequate sleep is reported to contribute to physician burnout [20-22]. Sleep loss has been identified as a risk factor for depression in training residents [23] and evidence reports the relationship between sleep and depression [24]. The findings in the interns, postgraduate registrars, and senior residents of our study could be a harbinger of such worse outcomes and is a cause for alarm.

It is noteworthy that those who exercised regularly reported significantly fewer days of 'feeling of fatigue' on waking up from sleep, than those who did not exercise. Though only an associated finding, it could point to the effect of exercise improving the quality of sleep, as has been described before [7-9]. We also found that in the group of doctors who did not do any exercise, the ESS score correlated negatively with total sleep duration (Table 3), implying a greater propensity for daytime sleepiness in those with fewer hours of sleep among them. Such a trend was not found in the group of doctors who exercised regularly, which is encouraging. The habit of regular exercise—a lifestyle factor—appears to have positively influenced some of the outcomes of our study, most likely due to the well-known effect of exercise improving sleep [7].

Interestingly, among the female doctors in our study, the number of days when the 'feeling of fatigue was reported, significantly correlated negatively with their total sleep duration. The female doctors who slept for less time experienced more days of 'feeling of fatigue' on waking up. This relationship indicates that non-restorative feelings on waking up are linked to short sleep durations. This connection is intuitive and expected. Nevertheless, this was not evident among the other sub-groups and when considering all 47 subjects together, suggesting that female doctors may be more vulnerable to the relation between short sleep and 'fatigue feeling', which requires further investigation. Published literature suggests a gender difference in sleep behavior and sleep disorders [6].

Our study is not without limitations, prime among them being that we did not use objective methods such as actigraphy to track the activity and sleep routine of our subjects, and neither did we consider the environmental and psychological factors which could affect the sleep parameters. Most field studies assess sleep quality using the Pittsburgh Sleep Quality Inventory [25,26]. We attempted to quantify the sleep in the young medical doctors of our study by analyzing the 14-day sleep diary maintained by the participants on a self-reported daily recall basis in an Indian context. We obtained data regarding the practice of daily exercise and its duration from the study participants. However, information regarding the type and intensity of exercise was not gathered. Nevertheless, all our participants who reported performing exercise conveyed having exercised for a minimum duration of 150 minutes per week.

In conclusion, the young medical doctors at our tertiary care hospital in the current study, sleep less than that recommended by the American Academy of Sleep Medicine and Sleep Research Society. Yet, daytime sleepiness is mostly in the higher range of normal level in them. This contrary finding could be an artefact, given that the mentally alerting schedule of young medical doctors prevents them from daytime napping or even thinking about it. Nevertheless, the ESS results are reassuring as it implies that the study participants were unlikely to be besieged by daytime sleepiness. We also observed a short self-reported sleep latency in them which might indicate insufficient sleep on the previous nights. At the same time, it is encouraging that none of the doctors had difficulty falling asleep. It remains a fact, that standards of sleep requirements, sleep architecture and daytime sleepiness in the Indian context have not yet been described, to compare against. We observed in this study that exercise habits, professional level, and gender of the young doctors appear to have played a role in the subjective feeling of fatigue experienced on waking up from sleep. Remarkably, exercise habit was found to be as-

sociated with a lesser frequency of subjective fatigue following sleep. Thus, regular exercise may benefit young doctors by positively contributing to restorative sleep in them. Our results contribute to the sleep data in India and will pave the way for future studies that ascertain the sleep pattern and identify the causes of deficient sleep in young Indian doctors.

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