



Original Research Article

Sleep wake pattern, daytime sleepiness and sleep quality in postgraduate students and demonstrators in medical non-clinical field

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ABSTRACT

Introduction: Sleep wake cycle is diurnal rhythm where human body oscillates between awake and sleeping state. Naps are effective in improving sleep and cognitive tasks. Sleep quality is evaluated from objective and subjective point of view. Sleep disorders cause daytime sleepiness. The study was done to assess sleep quality and pattern in postgraduates and demonstrators in non-clinical department.

Materials and Methods: The study was carried out in 94 subjects falling in age group of 24 -35 years. In the first phase, the study methodology was explained and health related questionnaires were completed. In the second phase, candidates kept a sleep diary for 14 days period that assessed the daily information on bedtimes, wake up times, how individuals wake up and nap times.

Statistical Analysis: The test of significance used were chi-square test and student t-test with p value < 0.05 significance & p < 0.001 being highly significant level.

Results: Mean age of doctors was 28.43 ± 2.64 . Mean sleep quality value was 5.80. Daytime sleepiness values both during the week [$\chi^2 = 218.65$] and on sunday [$\chi^2 = 138.74$] were non-significant. Most were intermediate in chronotype [n=43, 45.74%] followed by morning type [n=32, 34.04%]. Majority of the doctors took naps both during weekdays and on sunday more frequently after lunch.

Conclusion: Doctors had good quality sleep and less daytime drowsiness. Most doctors were intermediate type followed by morning type according to chronotype assessment and used alarm clock during weekdays. Naps were taken throughout the week though duration was more on sunday.

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1. Introduction

Sleep is a naturally recurring state of body and mind characterized by altered consciousness and relative inhibition of sensory activity, voluntary muscles along with reduced interactions with the surroundings. The need for sleep grows with the duration of wakefulness.¹ Wakefulness is also a recurring state of brain in which individual is conscious and engages in cognitive and behavioural responses. Wakefulness increases synchronous firing rates of cerebral cortical neurons and sleep produces opposite effects.²

During awake state, EEG records beta waves. This is followed by state of drowsiness where alpha waves with frequency of 8-13 per second is recorded. Sleep, architecture into N on- REM and REM types, follows drowsiness. The non-REM sleep has four stages. The stage 1 [5% sleep] of non-REM sleep records 3-7 cycles per second theta waves followed by stage 2 [25% sleep] with 12-14 cycles per second along with sleep spindles [waxing and waning amplitude] and K complexes. The stage 3 and stage 4 follows that records delta waves where 25% of sleep occurs. It is the deepest non-REM sleep where sleep walking, night terrors and bedwetting occurs. It is very difficult to wake a person in this stage. The REM sleep [25% sleep] on the other hand, records saw-tooth waves of low voltage. Dreams, night mares and long term memory

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consolidation by hippocampus occur in this sleep. Adults mostly wake out of REM or stage 2 sleep.^{3,4}

Sleep wake cycle is diurnal rhythm where human body oscillates between awake and sleeping state where sleep state lasts for at least 7 hours.⁵ The evolutionary norm for human is sleep state at night due to release of melatonin in darkness producing desire to sleep.⁶ The sleep wake cycle is a circadian rhythm regulated by suprachiasmatic nucleus. In a normal individual, sleep cycle begins with a sleep latency of about 5-15 minutes followed by non-REM or slow wave sleep with four stages [Stage 1-4] sequentially with increasing deep sleep. After that, sleep lightens and individual enters into REM latency followed by REM sleep. REM sleep gets progressively longer as the night progresses. One sleep cycle completes after REM sleep. The cycle repeats every 70-90 minutes.^{3,4}

For evaluating sleep quality, both objective and subjective point of view are considered. While objective sleep quality refers to the difficulty with which person falls to sleep, remains in sleepy state, number of times a person wakes up during a single night⁷, the subjective sleep quality refers to sense of being rejuvenated and regenerated after waking from sleep state.⁸ For satisfactory sleep, homeostatic sleep propensity that is the need for sleep as a function of the amount of time elapsed since the last adequate sleep episode, must be balanced against circadian rhythm.^{9,10}

Short naps are effective in improving sleep, mental health and cognitive tasks.¹¹ Studies have reported reduced cardiovascular mortality associated with daytime sleepiness as it allows the cardiovascular system to overcome stress.¹² Daytime sleepiness occurs due to less sleep or lack of sleep at night. It occurs mostly due to sleep disorders like obstructive sleep apnoea, narcolepsy, insomnia etc. which shortens the length of time asleep and reduces the quality of sleep making the person drowsy during the day.¹³

Daily workload has impact on mental health and produces symptoms of stress and burnout syndrome. Do doctors in non-clinical field have adequate sleep? Is sleep of good quality or do they experience daytime sleepiness? Or is it that lack of good quality sleep has effect on their professional activities? To answer these intriguing questions, present study was designed to explore the information on the sleep wake cycle to broaden its impact on professional activities.

2. Materials and Methods

The present study is an observational study and was performed in Postgraduate Department of Physiology of Government Medical College Jammu. Ethical clearance was taken from Institutional ethical committee of GMC Jammu, J&K wide no. IEC /Pharma /Thesis /Research /I₁₄ C / 2018 dated 1/9/18. Informed written consent for

participating in the study was taken from them. The subjects were chosen randomly with no gender bias between 24 to 35 years of age. The study subjects were in good health and not on any medications which otherwise might affect the variables under study. Subjects with clinical diagnosis of sleep disorder, other health related disorder that compromised with data collection and individuals who didn't complete the questionnaire were excluded.

The study was carried in two phases. In the first phase, the study objective and methodology were explained and health related questionnaires were completed. The general sleep pattern was assessed using Putilov sleep wake pattern questionnaire.¹⁴ The characterization of individuals based on chronotype (morning, evening and intermediate) was assessed using Horne and Ostberg questionnaire.¹⁵ Daytime sleepiness level and sleep quality were assessed using Epworth sleepiness scale¹⁶ and Pittsburgh sleep quality index¹⁷ respectively. The questionnaire are freely available. They were given and collected at later date to avoid resistance and to obtain greater adherence. In the second phase, candidates kept a sleep diary for 14 days period that assessed the daily information on bedtimes, wake up times of each individual, how individuals wake up and nap times.

Out of 100 postgraduate students and demonstrators chosen in non-clinical field, six were excluded as four of them didn't return the form and two were non complaint. So the final result was analysed on 94 candidates among which 53 were males and 41 were females. Those in the clinical field were excluded for the reason of variations in duty hours in different specialities.

2.1. Statistical Analysis

The statistical analysis was done using stats tester version 3.1.2. The test of significance used were chi-square test for assessing distribution of chronotype, daytime sleepiness level, sleep quality; student t-test for comparing mean nap onset, end times and duration between different days of the week, for assessing difference in sleep duration during different days of the week. The level of significance was at p value < 0.05 (*) and $p < 0.001$ being highly significant (***)

3. Results

Mean age of doctors was 28.43 ± 2.64 . The mean value for sleep quality was 1.89 ± 2.28 with $\chi^2 = 185.11$ and $p < 0.05$. Daytime sleepiness level both during weekdays and sunday exhibited non-significant response. During the week days, the mean value was 4.94 ± 3.38 [$\chi^2 = 218.65$] and on sunday, the mean value was 7.18 ± 3.25 [$\chi^2 = 138.74$]. According to chronotype, most of the doctors were intermediate type [$n=43$, 45.74%] followed by morning type [$n=32$, 34.04%]. Alarm clock was used by 62 subjects [65.95%] during weekdays and 77 subjects woke

up naturally on sunday [81.91%].

The mean values of wakeup time, bedtime and duration of sleep during different days of the week was as under Table 1 Figures 1 and 2]:

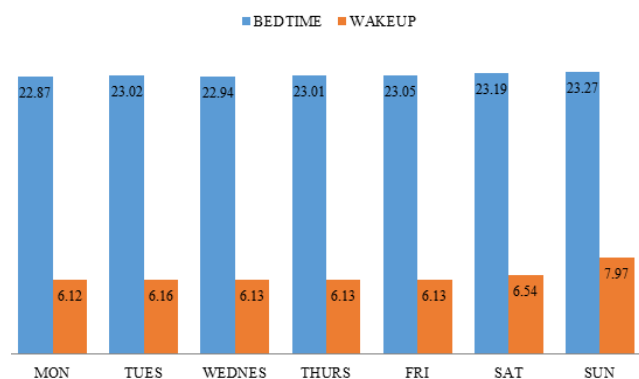


Fig. 1: Wakeup time and bed time

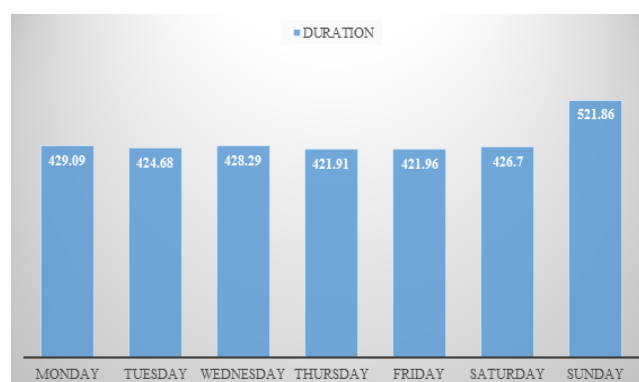


Fig. 2: Duration

The paired sample statistics between sunday and other days of the week exhibited highly significant differences in sleep duration at night at $p < 0.001$ level Figure 3 Table 2 .

Table 2: Sleep duration paired statistics

Pairs		Mean difference
PAIR 1	Sunday	92.76 ± 41.53
	Monday	***
PAIR 2	Sunday	97.18 ± 39.19
	Tuesday	***
PAIR 3	Sunday	93.56 ± 38.09
	Wednesday	***
PAIR 4	Sunday	99.94 ± 37.10
	Thursday	***
PAIR 5	Sunday	99.89 ± 36.10
	Friday	***
PAIR 6	Sunday	95.15 ± 31.82
	Saturday	***

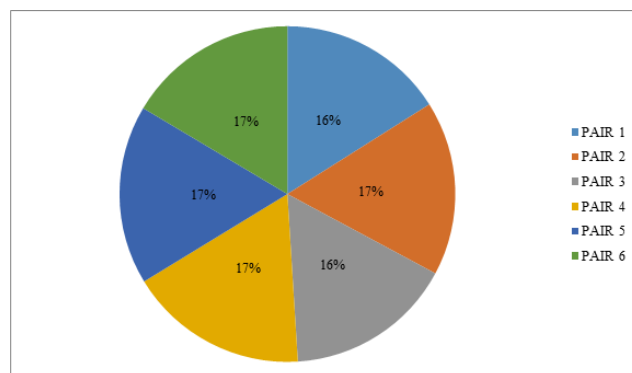


Fig. 3: Mean difference in sleep duration

Majority of the doctors took naps on all days of the week more frequently after lunch. The comparison between mean onset, end and duration of naps between weekdays and on sunday exhibited highly significant difference at p value < 0.001 level Table 3 Figure 4.

Table 3: Mean of nap distribution

Naps	Weekdays	Sunday
Onset	14.38 ± 0.28	13.21 ± 0.41 ***
End	15.20 ± 0.29	14.77 ± 0.62 ***
Duration	46.27 ± 15.99	91.70 ± 30.73 ***

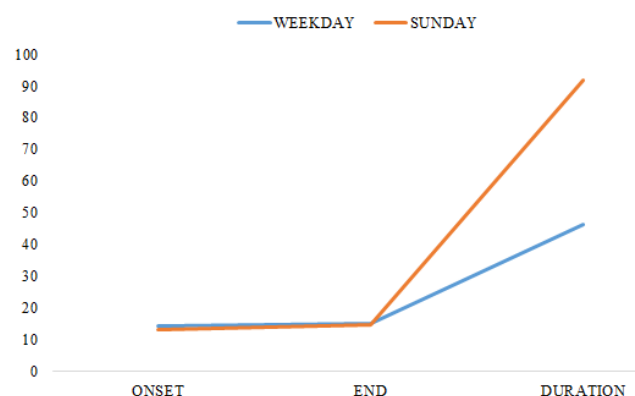


Fig. 4: Nap distribution

4. Discussion

Sleep helps to restore the vital processes of the body that maintain mood, memory, cognitive functions as well as functions of endocrine and immune system. In first phase of the study, sleep quality and daytime sleepiness levels were observed. In the second phase of the study, sleep wake cycle was observed and naps onset, end and duration were compared between weekdays and on sunday.

Table 1: Mean values during different days of the week

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Bedtime	22.87 ± 0.41	23.02 ± 0.38	22.94 ± 0.36	23.01 ± 0.34	23.05 ± 0.29	23.19 ± 2.40	23.27 ± 0.09
Wakeup time	6.12 ± 0.13	6.16 ± 0.08	6.13 ± 0.06	6.13 ± 0.10	6.13 ± 0.15	6.54 ± 0.25	7.97 ± 0.49
Duration	429.09 ± 27.17	424.68 ± 25.34	428.29 ± 21.730	421.91 ± 21.07	421.96 ± 20.38	426.70 ± 18.51	521.86 ± 29.51

4.1. First Phase study

In the present study, significant results were observed in sleep quality. Similar studies reported that subjects who slept on an average of 7 hours a night had better sleep quality related to health, satisfaction with life and lesser feelings of tension, depression, anger, fatigue and confusion compared to subjects with average sleep quantity. Sleepiness was also observed in subjects with low sleep quality compared to subjects with better sleep quantity.¹⁸ Social demands, elevated ambient temperature, noise level and natural ambient light contributes to reduced sleep duration, excessive daytime sleepiness, diminished sleep quality and high anxiety levels.¹⁹

Non-significant result in daytime sleepiness was observed in the present study. Previous studies reported bad quality of sleep to be significantly associated with excessive daytime sleepiness among university students.²⁰ Reduced sleep time produces negative consequences like daytime sleepiness, poor sleep quality, cognitive difficulties, mood alterations, attention and learning problems that may interfere with daily work.^{21,22,23}

4.2. Second Phase Study

Results showed that professional activities have strong influence on sleep wake cycle as 62 subjects used alarm clock to wake up during the weekdays. Moreover, highly significant difference was exhibited in sleep duration during different days of the week compared to sunday. Adults go to bed and wake up earlier during the week than on weekends due to influence of social commitments.^{24–26} Highly significant difference between nap onset, end and duration during weekdays and sunday was observed. Naps in the middle of the day may be due to normal reduction in wakefulness.^{27,28}

Sleep disturbances were observed in shift workers who often modified their sleep wake cycles according to their work time, though their rhythmic physiological functions like regulation of body temperature and hormone production did not change rapidly.²⁹ Fragmented sleep wake cycle was due to social demands, elevated ambient temperature, noise level and natural ambient light that follow the daytime pattern of society.³⁰

A study with larger sample size is required to assess the individual variations in sleep wake pattern and sleep quality.

The result of the present study maybe specific to the type of subject chosen.

5. Conclusion

It can be inferred from the results that the overall sleep quality was good and no sleep disturbance was observed. Daytime sleepiness levels during weekdays and on sunday were non-significant indicating that individuals didn't experience daytime sleepiness due to adequate sleep at night and naps in post lunch period also contributed to the same. Based on sleep wake pattern, most doctors according to chronotype were intermediate type followed by morning type.

Doctors used alarm clock to wake up in the early morning during weekdays while most woke up naturally on sunday indicating the influence of professional activities and working hours on sleep wake cycle. The duration of sleep was longer on sunday than any other day of the week probably as a compensation for the entire week. Naps were taken mostly in post lunch period. During the week, doctors ended their naps earlier and the duration was shorter than on sunday. It can be concluded that naps helped them to avoid daytime sleepiness.

6. Source of Funding

None.

7. Conflict of Interest

None.

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