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 [χ^2 = 218.65] and on sunday [χ^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.

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. 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.

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 night, 7 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. 3,4

Short naps are effective in improving sleep, mental
health and cognitive tasks. 9 Studies have reported reduced
cardiovascular mortality associated with daytime sleepiness
as it allows the cardiovascular system to overcome stress.
10 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. 11

Daily workload has impact on mental health and
produces symptoms of stress and burnout syndrome. Do
parents 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
and 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. 12 The characterization of individuals based
on chronotype (morning, evening and intermediate) was
assessed using Horne and Ostberg questionnaire. 13 Daytime
sleepiness level and sleep quality were assessed using
Epworth sleepiness scale 14 and Pittsburgh sleep quality
index 15 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 χ² =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 [ χ² =
218.65] and on sunday, the mean value was 7.18 ± 3.25
[ χ² = 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:

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.

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 2: Sleep duration paired statistics

<table>
<thead>
<tr>
<th>Pairs</th>
<th>Day of week</th>
<th>Mean difference</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAIR 1</td>
<td>Sunday</td>
<td>92.76 ± 41.53</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Monday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAIR 2</td>
<td>Sunday</td>
<td>97.18 ± 39.19</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Tuesday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAIR 3</td>
<td>Sunday</td>
<td>93.56 ± 38.09</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Wednesday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAIR 4</td>
<td>Sunday</td>
<td>99.94 ± 37.10</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Thursday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAIR 5</td>
<td>Sunday</td>
<td>99.89 ± 36.10</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Friday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAIR 6</td>
<td>Sunday</td>
<td>95.15 ± 31.82</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Mean of nap distribution

<table>
<thead>
<tr>
<th>Naps</th>
<th>Weekdays</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>14.38 ± 0.28</td>
<td>13.21 ± 0.41***</td>
</tr>
<tr>
<td>End</td>
<td>15.20 ± 0.29</td>
<td>14.77 ± 0.62***</td>
</tr>
<tr>
<td>Duration</td>
<td>46.27± 15.99</td>
<td>91.70 ± 30.73***</td>
</tr>
</tbody>
</table>

### 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.
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. 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. 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. 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.

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. Highly significant difference between nap onset, end and duration during weekdays and on sunday was observed. Naps in the middle of the day may be due to normal reduction in wakefulness. 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. 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.

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.

References


Author biography

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