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Original Research Article

Self-reported sleep latency: pattern, association and predictors among medical residents in India

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ABSTRACT

Background: Sleep latency is one of the key parameters in sleep medicine due to its utility in screening, diagnosis and treatment of sleep disorders. The normative values of sleep latency are not well established. The measurement is made objectively using tests such as multiple sleep latency test (MSLT), but even the self-reported sleep latency values are a part of many established measurement scales such as Pittsburg sleep quality index (PSQI). Aim was to assess whether self-reported sleep latencies have any association with excessive daytime sleepiness (EDS) and whether socio-demographic and sleep variable predictors could be identified for sleep latency.
Methods: A cross sectional study was done at a tertiary care teaching hospital with 430 enrolled medical resident doctors as subjects. Pre-validated sleep questionnaire, Epworth sleepiness scale (ESS) and sleep hygiene index (SHI) were provided to eligible resident doctors to collect data on socio-demographics, sleep latency and other sleep variables.
Results: A total of 350 resident doctors responded (82%). EDS was found in 47.6% of resident doctors. Self-reported sleep latency mean was 13.35 minutes (95% CI 13.88-16.95); 58.5% had sleep latencies of 10 or less minutes and 21.8% had more than 20 minutes. Stepwise linear logistic regression identified seven significant predictors of sleep latency.
Conclusions: ESS scores were found to be negatively correlated with sleep latency values. Sleep hygiene, sleep quality and exercise were positive predictors and weekly work hours, ESS scores, liquor consumption and liquor intake within 4 hours of bedtime were negative predictors of sleep latency.

Keywords: Sleep latency, Excessive daytime sleepiness, Sleep quality, Sleep hygiene, Exercise

INTRODUCTION

Sleep and wakefulness are highly regulated states of brain activity. They are regulated by a balance of homeostatic drive for sleep, circadian rhythm mechanisms and a composite interaction of external and internal stimuli.[1,2]

The quantity and quality of sleep should be sufficient to make an individual feel refreshed, remain alert and function normally throughout the day.[3] When healthy adults receive an average of less than 5 hours of sleep per night, the homeostatic drive to sleep rises drastically, as evidenced by an increased propensity to sleep.[4] This usually manifests as a change in sleep onset latency.

With ongoing sleep deprivation (getting 2 to 3 hours less sleep than optimal), people develop a sleep debt.[5,6] If the sleep debt continues over 5 to 10 days, the maximum alertness level will gradually come down along with the reduction in general performance, and particularly cognitive performance. In addition, there will be worsening of response times, mood, motivation, morale and initiative.[7] Sleep debt arising from sleep deprivation is one of the most common causes of excessive daytime sleepiness (EDS).[3,8,9] Sleep latency is a key factor in various objective and subjective scales used for the measurement of EDS and various other sleep disorders.

Sleep latency is perhaps one of the most important parameter in a sleep research. Sleep latency is the duration of time between when the lights are turned off (lights out) as the patient attempts to sleep, until the time patient actually falls asleep, as evidenced by EEG and behavioral parameters changes consistent with sleep.[10] Sleep latency is the time in minutes from ‘lights out’ that marks the starting of total recording time to the first epoch scored as sleep.[11]

Measuring and studying sleep latency has many benefits. Dement et al, Carskadon et al, and other have worked extensively to find out an objective measure of daytime sleepiness to help assess the effects of sleep disorders.[6,12] In their course of evaluating experimental results, they found that the amount of time it took to fall asleep in bed was closely linked to the subjects' own self-evaluated level of sleepiness.[6] They developed Multiple Sleep Latency Test (MSLT) that objectively measures sleep latency. A sleep latency of 0 to 5 minutes indicates severe sleep deprivation, 5 to 10 minutes is "troublesome," 10 to 15 minutes indicates a mild but "manageable" degree of sleep debt, and 15 to 20 minutes is indicative of "little or no" sleep debt, but the exact normal values have not been determined.[6,12,13] Sleep latency more than 30 minutes is classified as sleep onset insomnia.[14]

Carskadon et al noted that subjective ratings of sleepiness made before a sleep recording frequently predicted the sleep latency. The protocol designed to test sleep latency as an objective measurement of the state of “sleepiness-alertness” by measuring sleep tendency before, during, and after 2 days of total sleep deprivation has become the standard protocol for the MSLT. The choices of a 20-minute duration of a single test and a 2-hour interval between tests were essentially arbitrary and necessitated by the practical demands of that study.[12]

Some researchers suggest that sleep latency need to be measured in natural settings for it to be more accurate, reliable and valid. Sleep latency is affected by factors such as the amount of importance given to check the accuracy in the patient's sleep diary and if the ‘lights out’ time was close to the patient's routine bedtime at home. Obviously, if the lights are turned off earlier than the patient's usual bedtime, sleep latency would be spuriously long due to the subject’s inability to fall asleep until his/her usual sleep time is reached. Similarly, spuriously short sleep latency will be recorded if the ‘lights out’ time is later than the patient's usual bedtime. Hence, it is of prime importance that the subject's usual habitual sleep time is incorporated into the sleep study design.[11]

Since sleep latency is the time from lights out wakeful state until sleep onset, it may be thought of as being able to be measured with reliability and validity even by self-reports. It may also be worthwhile to study the self-reported sleep latency and its associations.

Excessive daytime sleepiness (EDS), defined as difficulty in maintaining an alert awake state, usually accompanied by a rapid entrance into sleep when the person is sedentary.[15] Most people can relate some instances of falling asleep when they intended to be awake. Sleepiness is a normal feeling on approaching a typical sleep period or after prolonged wakefulness. Excessive sleepiness may manifest as sleep in an inappropriate setting or as episodes of unintentional sleep. Studies have documented its prevalence ranging from 5% to 80% in many settings.[8,9,16-23]

EDS can be detected by objective tests such as MSLT and maintenance of wakefulness test (MWT). The MSLT quantifies the time to sleep objectively on the basis of the time to onset of physiologic changes associated with sleep across five trials separated by 2 hours each across the typical wake period. Sleep is determined by the loss of the posterior dominant rhythm on the electroencephalogram or, in the absence of posterior dominant rhythm, slow eye movements, vertex sharp waves, and slowing of the background electro-encephalographic activity.[12]

Unfortunately, the MSLT is not well correlated with daytime function, and produces significant false positives and false negatives. Although the MSLT can “quantify” the degree of sleepiness on a particular day, the test is validated only for the diagnosis of narcolepsy (type 1 and type 2). The MWT quantifies the propensity to stay awake during four attempts in a dimly lit room. This test has not been extensively tested in relationship to daytime function.[10]

More widely, EDS is measured by scales such as Epworth sleepiness scale (ESS), a valid and reliable scale, which asks for the propensity to fall asleep under certain circumstances.[24] There are many such valid and reliable tools developed to measure sleep problems. Self-reported sleep latency is a component included in scales such as Pittsburg sleep quality index (PSQI).[25]

There are only a few studies which have looked at the predictive factors for sleep latency.[26-28] Some literature suggests that there is a link between physical activity/exercise, sleep quality and sleep hygiene with sleep latency. Mechanism underlying the relationship between exercise and sleep quality is unclear, but there have been well established positive effects in a number of populations. Exercise has been shown to improve sleep latency and sleep efficiency in patients with chronic primary insomnia. Adolescents with increased physical activity report fewer symptoms of insomnia and better sleep quality, along with objectively measured improvements in total sleep time and wake after sleep onset. Subjective sleep latency and total sleep times were improved with moderate-intensity exercise in sedentary older adults. In middle-aged women, greater recent exercise was associated with improved sleep efficiency and sleep quality. Exercise is a proposed modality to improve sleep quality and quality of life in people with diabetes, heart failure, breast cancer, pregnancy, and menopause, among others.[10,29,30]

Occupational stress and work factors play a major role in the development of sleep problems. Results from both cross-sectional and prospective studies support this connection. High job demands, socioeconomic factors, cultural factors and low social support contribute to work-related sleep problems. Long-term occupational stress may result in severe fatigue, impaired cognition, and depressed mood; associated sleep disturbance is characterized by sleep fragmentation, increased sleep latency, and reduced slow wave sleep. A blunted cortisol response (dexamethasone suppression test) and an exaggerated cortisol awakening response indicate involvement of the hypothalamic-pituitary-adrenal axis.[10,28,31,32]

Sleep disorders such as EDS are increasing alarmingly all over the world due to social, work, stress and life-style factors. Addressing public health problems of such magnitude requires tools which are simple, reliable and valid. They help in measuring the effects of public health interventions in field settings at a lower cost. In this context, it is worthwhile to study the self-reported sleep latency and its associations.[24]

Many studies show that sleep latency is improved by pharmacologic interventions such as benzodiazepines, GABA receptor agents, and melatonin as well as non-pharmacologic interventions such as exercise, etc.[30,33,34] A meta-analysis demonstrated the effect of melatonin in decreasing sleep onset latency, increasing total sleep time and improving overall sleep quality.[35]

Though there are a few studies which report that the sleep latency by self-report may be slightly overestimated than that measured objectively by MSLT, the utility of self-reported sleep latencies cannot be ruled out in public health settings.[36] We plan to present the findings from our study involving postgraduate medical resident doctors who are believed to have a clear understanding of the concept of sleep latency.[16,17] This study is intended to assess the association of self-reported sleep latency with EDS and find its predictor socio-demographic and sleep variables.

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 study was conducted from July 2008 to June 2009. There were 6 groups of residents at any point of time in the institute. There were more than 70 residents per group. The list of all the residents was obtained from the concerned authorities with a prior approval from the Institutional Ethics Committee.

A cross sectional descriptive study was designed in which all participants were interviewed and administered the assessment protocol once. The information on socio-demographics and sleep-related factors was collected using the sleep assessment proforma.[37] The assessment of EDS was conducted using the Epworth Sleep Scale (ESS) with qualitative definition of EDS as normal (scores 0-9), mild EDS (score 10-12), moderate EDS (scores 13-14) and severe EDS (score >14).[38-40]

There were 430 residents enrolled at the time of assessment and all were included in the study. A list of all the resident physicians enrolled was obtained from the training branch administration. The list consisted of resident physicians from all parts of India. The study population was a uniform homogenous population with regard to age as most of the physicians were in mid and late 20’s.

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. Residents who were pregnant, sick, or admitted to the hospital were excluded (n=2) from the study. After an initial brief interview, socio demographic data was collected followed by self-administration of tools and questionnaire in sequence i) Sleep assessment proforma ii) ESS iii) SHI, which took about 30 minutes. Clarifications were made to the study participants on various aspects of the study tools and questionnaire. The collection of the data was conducted mainly in the afternoons, post lunch sessions, and in the early evening.

The assessment tools (ESS and SHI) and sleep assessment proforma had been in use and were validated by prior studies.[37,39,41] The face validity for all these tools was assessed by the combined opinion of about 25-30 experts (faculty, senior residents), colleagues and study subjects prior to data collection. The tools were 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 each questionnaire was noted. Necessary changes in the tools/ survey plan were executed as per the observations during the pilot study.

The data was entered into SPSS® Statistical Package 24.00 for analysis. The statistical tests used were percentage, mean, S.D., χ^2 test, t- test, ANOVA, logistic regression analysis, and multivariate analysis. The analysis was performed to evaluate the association of study variables with the outcome and not the causation. The results were presented in terms of mean differences, differences in proportions, odds ratios/β co-efficient with statistical significance using appropriate statistical methods.

RESULTS

The socio-demographic profile of study subjects showed 80.6% were male and 19.4% were female. Among them 73.3% were unmarried. The consumption of more than 2 cups of tea/coffee was reported by 34.3% and 42.3% consumed coffee or tea within 4 hours of bedtime. Smoking tobacco was reported by 8%. Body mass index (BMI) was normal range in 66.9%, obesity range in 24.9% and lower range in 5.1% of the study participants.

Table 1 shows the presence of statistically significant difference in sleep latency means between EDS and non EDS groups. Also, Pearson test shows negative correlation(r =-0.164, p<0.001). Similarly, univariate linear regression shows inverse association (R^2=0.027; F (1, 349)=9.624, p<0.01; B=-0.047; constant=10.101).

Table 2 and Table 3 show the distribution of sleep latency. It has a mean of 15.35 minutes, median of 10.00 minutes. A total of 18.9% of respondents had 5 minutes of sleep latency, 26.6% had 10 minutes, 14.6% had 15 minutes, and 16% had 30 minutes of sleep latency respectively. About 10.6% and 5.7% of the respondents either too large or too small sleep latencies amounting for a total of 16.3% respondents having extremes of sleep latencies.

Table 1: Sleep latency means in EDS and non EDS groups, and association with ESS scores (n=350).

Variable	EDS (n=166, 47.6%)	No EDS (n=183, 52.4%)	t	P (2-tailed)
	Mean (SD)			
Sleep latency (in minutes)	12.77 (10.66)	17.78 (17.40)	3.203	0.001*

Pearson correlation between sleep latency and ESS scores: -0.164 (p<0.01), n=349; Linear regression of sleep latency with ESS scores: R^2=0.027; F (1, 349)=9.624, p<0.01; B=-0.047; Constant=10.101.* Significant at p<0.01 level.

Table 2: Sleep latency among resident doctors (n=350).

Sleep latency in minutes	Percentage (%)
0-5	29.7
>5-10	28.8
>10-20	19.7
>20-30	16.0
>30	5.8

Table 3: Self-reported sleep latency distribution among resident doctors (n=350).

Sleep latency in minutes	Frequency	Percentage (%)	SE	95% CI	Cumulative percentage (%)
0.00	2	0.6	0.4	0.0 - 1.4	0.6
1.00	9	2.6	0.9	1.1 - 4.3	3.1
2.00	20	5.7	1.3	3.4 - 8.3	8.9
3.00	6	1.7	0.7	0.6 - 3.4	10.6
4.00	1	0.3	0.3	0.0 - 0.9	10.9
5.00	66	18.9	2.0	14.9 - 22.6	29.7
6.00	7	2.0	0.8	0.6 - 3.4	31.7
7.00	1	0.3	0.3	0.0 - 0.9	32.0
10.00	93	26.6	2.5	21.7 - 31.1	58.6
15.00	51	14.6	1.9	10.6 - 18.6	73.1
20.00	18	5.1	1.2	2.9 - 7.7	78.3
30.00	56	16.0	1.9	12.3 - 20.0	94.3
40.00	2	0.6	0.4	0.0 - 1.4	94.9
45.00	6	1.7	0.7	0.6 - 3.4	96.6
60.00	9	2.6	0.9	0.9 - 4.6	99.1
90.00	2	0.6	0.4	0.0 - 1.4	99.7
120.00	1	0.3	0.3	0.0 - 1.1	100.0

Sleep latency: Median-10; Mode-10; Mean-13.35 (95% CI 13.88-16.95).

Table 4: Self-reported sleep latency means across categories of socio-demographic and sleep variables in participants (ANOVA) (n=350).

Variables	Category	n	Sleep latency mean (SD)	F	P value	Eta squared
Sex	Male	282	15.59 (15.34)	0.389	0.533	0.001
	Female	68	14.35 (12.21)			
Marital status	Married	92	14.41 (12.46)	0.508	0.476	0.001
	Unmarried	258	15.69 (15.53)			
Department	Surgical	174	15.20 (14.92)	4.582	0.011	0.026
	Medical	133	13.61 (11.94)			
	Non-clinical	43	21.37 (20.08)			
Coffee/tea per day	0-2 cups	229	14.27 (12.99)	3.574	0.060	0.015
	>2 cups	121	17.40 (17.56)			
Coffee/tea intake within 4hrs of bedtime	Yes	148	17.17 (17.85)	5.100	0.025	0.015
	No	194	13.59 (11.37)			
Liquor consumption frequency/week	No	271	15.30 (13.92)	0.237	0.789	0.001
	1-2/week	74	14.14 (13.23)			
	>2/week	2	17.50 (3.53)			
Consumption of liquor within 4 hrs of bedtime	Yes	38	21.78 (15.87)	10.205	0.002	0.029
	No	302	14.28 (13.34)			
Smoking	Yes	28	14.28 (11.26)	0.096	0.756	0.000
	No	321	15.12 (13.90)			
Smoking within 4 hrs of bedtime	Yes	21	15.33 (11.85)	0.008	0.928	0.000
	No	326	15.05 (13.86)			
Physical activity frequency/week	Nil	213	14.26 (12.92)	2.588	0.077	0.015
	1-3 d	106	16.14 (15.71)			
	>4 d	30	20.53 (21.78)			
Physical activity amount/week	<30 min	241	14.52 (14.60)	1.225	0.295	0.007
	30 min-2 hr	81	16.83 (13.38)			
	>2 hr	26	18.07 (19.97)			
Sleep quality in last one week	Refreshing	202	13.99 (10.87)	4.120	0.043	0.012
	Non-Refreshing	148	17.22 (18.73)			
Sleep hygiene by SHI	Hygienic	50	12.00 (9.33)	3.101	0.079	0.009
	Un-hygienic	299	15.96 (15.45)			
Sleep quality on VAS*	Good	160	12.90 (10.04)	4.280	0.015	0.024
	Fair/Average	153	17.15 (15.84)			
	Bad	37	18.54 (23.71)			
EDS	Yes	166	12.77 (10.66)	10.260	0.001	0.029
	No	183	17.78 (17.40)			
BMI	Low	18	12.38 (9.38)	1.228	0.294	0.007
	Normal	243	16.19 (16.12)			
	Obese	88	13.81 (11.31)			
Work hours/week	≤80	152	18.30 (15.44)	11.019	0.001	0.031
	> 80	198	13.09 (13.87)			

*VAS- Visual analogue scale of 0-8 score to measure sleep quality, (1-3= Good, 4-5= Fair/Average, 6-8= Bad).

Table 4 shows the means and standard deviations of sleep latency means across various categories of study variables. ANOVA F and p values are also depicted along with eta squared values as a measure of association. It is evident that the category mean sleep latencies are significantly different for sleep quality, department type, weekly work hours, EDS, VAS sleep quality, refreshing sleep in last one week, coffee/tea and liquor consumption within 4 hours of bedtime. It is also interesting to see that the differences appear to approach significance for sleep hygiene by SHI, physical activity frequency and coffee/tea consumption.

Table 5 shows the results from stepwise linear regression modeling of sleep latency with explanatory variables. The overall model was statistically significant at $p<0.05$ ($R=0.380$, $R^2=0.144$, Adjusted $R^2=0.126$). A total of 14 study variables were used in a stepwise manner to identify predictors of sleep latency. The best prediction model was reached in seven steps yielding seven significant predictors of sleep latency which are depicted in Table 5.

Variables excluded in stepwise linear regression include BMI, coffee/tea consumption, coffee/tea intake within 4 hours of bedtime, smoking, smoking within 4 hours of bedtime, department type, amount of physical activity, sleep quality in last one week. Inverse predictive relationship is seen with weekly work hours, ESS scores, liquor consumption and liquor intake within 4 hours of bedtime.

A positive predictive relationship is seen with Sleep Hygiene Index score, sleep quality and frequency of physical activity. The model was statistically significant, F (7,331)=7.811, p<0.001, and accounted for approximately 14.4% of the variance of R^2=0.144, adjusted R^2=0.126. The raw and standardized regression coefficients of the predictors together with their correlations with sleep latency, their squared semipartial correlations, and their structure coefficients are shown in Table 5.

Table 5: Stepwise linear regression for predictors of sleep latency (n=331).

Variables in final model	β	SE β	Standardized β	Pearson r	SR^2	Structure coefficient
Constant	31.724	7.875				
Work hours in one week	-0.090	0.032	-0.153	-0.178	0.021	-0.468
SHI score	0.338	0.123	0.150	0.161	0.019	0.423
ESS score	-0.533	0.172	-0.166	-0.148	0.025	-0.389
Sleep quality on VAS (0-8)	1.335	0.498	0.150	0.125	0.018	0.328
Liquor within 4 hours of bedtime	-8.845	2.632	-0.202	-0.131	0.029	-0.344
Liquor (Y/N)	-5.321	1.895	-0.169	-0.063	0.020	-0.165
Frequency of physical activity	2.206	1.104	0.106	0.121	0.010	0.318

SE- Standard error; CI- Confidence interval; VAS- Visual analogue scale; Dependent variable sleep latency, R=0.380, R^2=0.144, Adjusted R^2=0.126, SR^2 is semipartial correlation, F (7, 331)=7.811, p<0.000; p<0.05*.

DISCUSSION

Excessive daytime sleepiness among the studied medical resident doctors was high at 47.6% and about 58% had sleep latencies less than or equal to 10. The socio-demographic characteristics indicate that they were in their mid- to late-twenties, and 80% were male, 73% unmarried, 34% drank coffee/tea and 43% within 4 hours of bedtime, 8% smoked cigarettes, about 60% never had physical activity/exercise in addition to their work and BMI was abnormal in about one third. There are previous studies which have reported higher prevalence of EDS and smaller sleep latencies with such a socio-demographic profile where predominantly high work demands, stress, stimulant use and lack of physical activity were present. The role of age on sleep latency is nullified due to homogeneity of the study group.[20]

The sleep latency reported by these medical resident doctors had a mean of 13.35 minutes; 58.5% had sleep latencies of 10 or less minutes and 21.8% had more than 20 minutes. It is well established that shorter sleep latencies are associated with EDS and this is used in MSLT for diagnosis of various sleep disorders such as EDS, narcolepsy etc. It can be seen in our study that the EDS estimated using ESS with a cut off score of 9 is near to the proportion of sleep latencies of 10 or less minutes. Also, there was significant correlation and association between sleep latency and EDS.

Though we do not have MSLT data for the studied group to compare objectively measured sleep latencies with that of self-reported ones, we have some evidence to say that even self-reported latencies may have a role to indicate the level and trends of EDS in population groups. It should be a point for further research as to what is the utility of self-reported sleep latencies in monitoring of interventions to address sleep problems at a lesser cost and in larger public health and population settings.

Sleep latency predictors identified in our study include those which tend to increase latency as well as some which decrease it. The sleep latency mean differences were statistically significant for sleep quality, department type, weekly work hours, EDS, VAS sleep quality, refreshing sleep in last one week, coffee/tea and liquor consumption within 4 hours of bedtime.

However, the stepwise linear logistic regression modelling identified seven factor model where inverse predictive relationship of sleep latency was evident with weekly work hours, ESS scores, liquor consumption and liquor intake within 4 hours of bedtime. A positive predictive relationship was seen with Sleep Hygiene Index score, sleep quality and frequency of physical activity. These findings are consistent with previous studies.[10,42-44] Although the mechanisms by which these factors affect sleep latency are described in literature, further studies needed to establish biological links unequivocally.

This is significant because knowing factors and their direction of association would help researchers to devise intervention strategies. Hence, there is a need for high quality studies with subjective and objective measurement components to establish robust evidences regarding the utility of subjective or self-reported measures.

There are many studies which have suggested the required sample sizes when using multiple linear regression for prediction.[45] Some suggest that for an R^2 value of around 0.15, with about 5-7 predictor variables, a sample of around 350 would give a good prediction model if not excellent.[45] We also conducted a post hoc analysis using freely available G*Power 3® software to know the achieved power in our study using random model linear multiple regression.[46-48]

For the α=0.05, sample size of 331, H_1 R^2 of 0.14 and H_0 R^2 of 0, and for 7 predictors, the power (1-β) was found to be 0.999 which is very much higher than the acceptable 0.80 limit (critical R^2=0.048, lower critical R^2=0.005); power for 14 predictors was 0.999 with critical R^2=0.077 and lower critical R^2=0.017. With these findings we report that our simple size was sufficient enough to get a good predictor model for sleep latency.

This study was a cross sectional survey and data recorded may have had respondents' biases. But, the understanding of the concept of sleep latency and its response may have been accurate considering the fact that the respondents were postgraduate medical resident doctors. Also, when conducting future studies on general population groups, researchers may have to properly educate the respondents on what exactly is meant by sleep latency.

There is also a need for sleep latency studies among healthy normal general population groups to establish normative sleep latency values. It is also documented that sleep latency varies with age. Establishing a reference data would help researchers and health professionals to address sleep problems, disorders and their associated adverse health outcomes.

CONCLUSION

Sleep latency is a very important component of sleep science which needs to be studied further due to its utility in screening, diagnosis and treatment of sleep disorders. Our study demonstrates the association of self-reported sleep latency with EDS. Also, sleep hygiene, sleep quality and exercise are positive predictors, which increase sleep latency towards normal. Factors positively associated with EDS such as weekly work hours, ESS scores, liquor consumption and liquor intake within 4 hours of bedtime are negative predictors of sleep latency, which decrease it to lower values.

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