Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

ORIGINAL RESEARCH

ASSESSMENT OF EFFECT OF SLEEP DEPRIVATION ON POSTURAL CONTROL IN RESIDENT DOCTORS

Dr Naveen Bhartia Porwal

Associate Professor and Head, Deptt of Physiology, ASJSATDS Medical College FatehPur, UP, India

Correspondence:
Dr Naveen Bhartia Porwal
Associate Professor and Head, Deptt of Physiology, ASJSATDS Medical College FatehPur, UP, India

Abstract

Background: Sleep is essential for health and sleep disturbances can cause a number of disorders. The present study was conducted to assess effect of sleep deprivation on postural control in resident doctors.

Materials & Methods: 50resident doctors of both genders were included. Resting pulse rate and blood pressure were measured. Progressive sleepiness and postural control was measured at fixed intervals of 0, 6, 12, 18, and 24 h of SD during their 24 hours duty period. Assessment of degree of sleepiness: Sensation of sleepiness was subjectively assessed using the "Pictorial Sleepiness Scale Based on Cartoon Faces" and scored on a 5 points scale.

Results: Out of 50 subjects, males were 30 and females were 20. The mean score at baseline was 0.1, at 6 hours was 0.1, at 12 hours was 0.34, at 18 hours was 1.35 and at 24 hours was 1.80. The difference was significant ($P< 0.05$). The mean sleepiness score at baseline was 1.0, at 6 hours was 1.3, at 12 hours was 1.5, at 18 hours was 2.4 and at 24 hours was 3.6. The difference was significant ($P< 0.05$).

Conclusion: Sleep deprivation significantly deteriorates the postural control.

Key words: postural control, Sleep deprivation, resident

Introduction

Sleep is essential for health and sleep disturbances (insufficient duration, poor quality, and irregular timing) can cause a number of disorders. With respect to sleep research, the duration is the most frequently investigated measure because it is easily obtained by an individual inquiry.[1] The appropriate sleep duration for adults has been suggested to be more than 9 hours per night, while other authors claimed that a minimum of 7–8 hours of sleep would be sufficient.[2] Several factors, such as work demands, can reduce the sleeping duration below the recommended values eliciting a wide range of effects on mood, cognitive and motor functions.Sleep disorders have a negative impact on postural control (PC) and the standing posture is crucial to perform different tasks, from reaching to locomotion. Moreover, sleep

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

disorders and subsequent PC deterioration are related to work accidents, like driving accidents and falls among frail populations, such as the elderly.[3]

Resident doctors suffer from intense mental fatigue due to stress full duty period with sleep deprivation. The decreased duration of sleep on a daily basis leads to chronic sleep deprivation (SD).[4] Resident doctors undergo short periods of total SD ranging from 24 to 48 hours while being on continuous duty. The reduction in performance after 24 hours of SD has been equated to the effect of a 0.1% blood alcohol concentration.[5]The present study was conducted to assess effect of sleep deprivation on postural control in resident doctors.

Materials & Methods

The present study comprised of 50residentdoctors of both genders. The consent was obtained from all enrolled patients.

Data such as name, age, gender etc. was recorded. All subjects were asked to avoid any heavy exercise before the recording of parameters. They were instructed not to take tea, coffee or any drinks 1 hour before the recordings. Resting pulse rate and blood pressure were measured. Progressive sleepiness and postural control was measured at fixed intervals of 0, 6, 12, 18, and 24 h of SD during their 24 h duty period. Assessment of degree of sleepiness: Sensation of sleepiness was subjectively assessed using the "Pictorial Sleepiness Scale Based on Cartoon Faces" and scored on a 5 points scale.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of subjects

Total- 50		
Gender	**Males**	**Females**
Number	30	20

Table I shows that out of 50 subjects, males were 30 and females were 20.

Table II Assessment of one leg stand test score for postural control

Time	One leg stand test	P value
0	0.1	0.04
6	0.1	
12	0.34	
18	1.35	
24	1.80	

Table II, graph I shows that mean score at baseline was 0.1, at 6 hours was 0.1, at 12 hours was 0.34, at 18 hours was 1.35 and at 24 hours was 1.80. The difference was significant (P< 0.05).

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Graph I Assessment of one leg stand test score for postural control

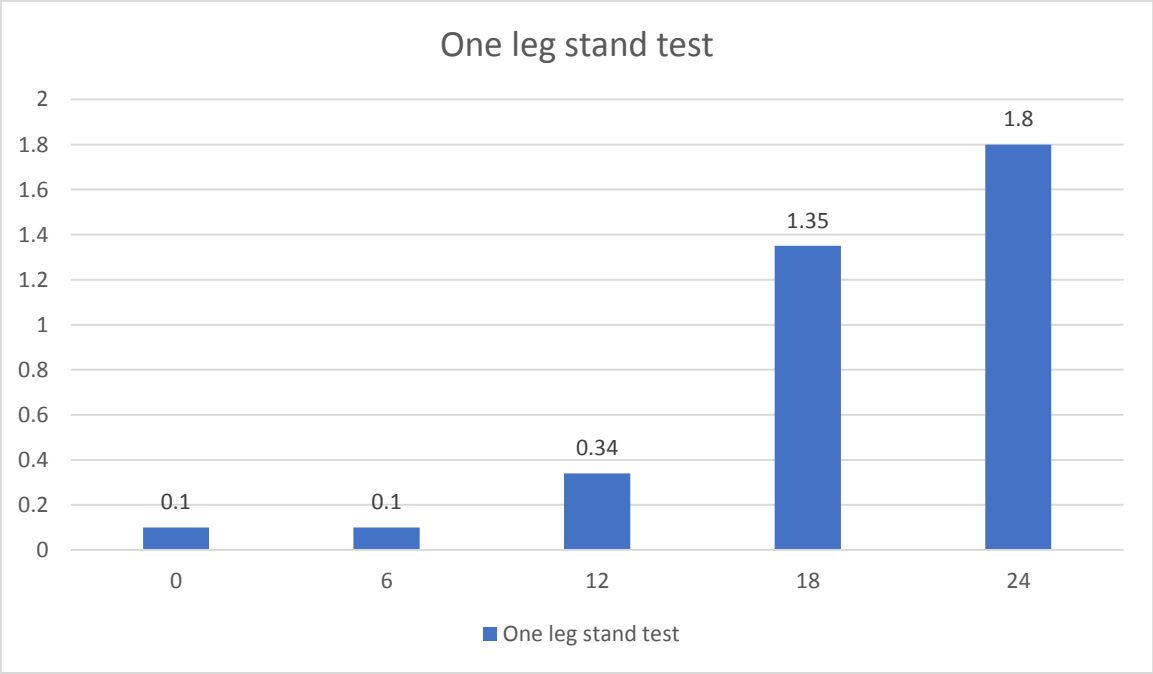


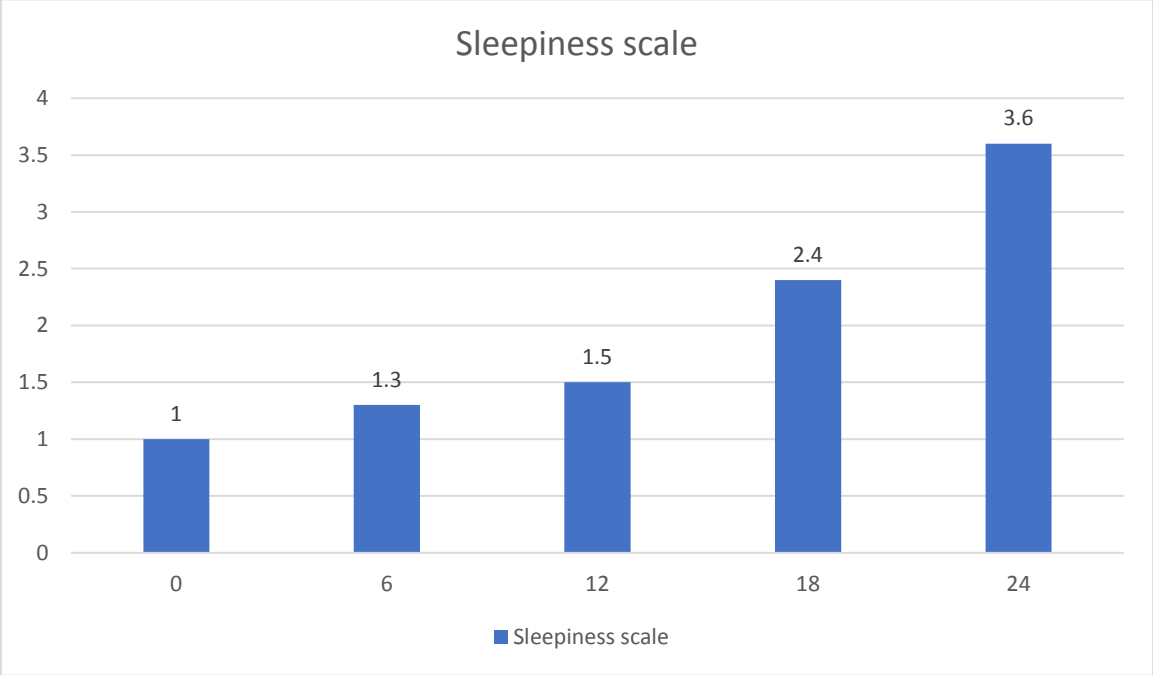
Table III Assessment of Sleepiness scale

Time	Sleepiness scale	P value
0	1.0	0.05
6	1.3	
12	1.5	
18	2.4	
24	3.6	

Table III, graph II shows that mean sleepiness score at baseline was 1.0, at 6 hours was 1.3, at 12 hours was 1.5, at 18 hours was 2.4 and at 24 hours was 3.6. The difference was significant ($P< 0.05$).

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Graph II Assessment of Sleepiness scale



Discussion

Mental fatigue is believed to be a gradual and cumulative process associated with a disinclination to exert any effort, reduced efficiency, alertness and impaired mental performance. The body's Postural Control depends on coordination of the central nervous system (CNS) with visual sense, proprioceptive sense and vestibular information and regulation of the CNS to exercise the effector organs.[6] Any change in these processes will influence Postural Control. The effects of sleep deprivation on vestibular responses have been the subject of a few studies. It has been shown that sleep deprivation in humans can induce an alteration in the posterior parietal cortex that plays a crucial role in the processing of vestibular information in relation with space representation.[7]The present study was conducted to assess effect of sleep deprivation on postural control in resident doctors.

We observed that out of 50 subjects, males were 30 and females were 20. Yogi et al[8]evaluated the effect of sleep deprivation on postural control at different durations of SD, to identify the duration of SD after which Postural control is affected and to correlate the subjective assessment of sleepiness and postural control in resident doctors during the 24 h duty period. One leg stand test was used to measure Postural Control and Pictorial Sleepiness Scale measured the degree of sleepiness 6 hourly in 30 resident doctors during their 24 h duty. Mean one leg stand test score increased with increasing duration of SD. The scores were significantly reduced at SD of 18 h ($p< 0.001$)., There was positive correlation between pictorial sleepiness scale and one leg stand test score ($r = 0.6619$).

We found that mean score at baseline was 0.1, at 6 hours was 0.1, at 12 hours was 0.34, at 18 hours was 1.35 and at 24 hours was 1.80. Sleep deprivation or restriction is related to the total sleep time, loss of one or more sleep phases and also with the sleep quality. Therefore, low sleep quality is a type of sleep deprivation. Research has shown that inadequate sleep can affect vigilance, information integration, reasoning abilities and motor control performance, such as posture control.[9] To maintain effective performance, sleep quality is as important as

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

sleep quantity. Consequently, subjects should be assessed about their sleep patterns such as sleep interruptions, sleep latency, total sleep time, and frequency of awakenings.[10]

We found that mean sleepiness score at baseline was 1.0, at 6 hours was 1.3, at 12 hours was 1.5, at 18 hours was 2.4 and at 24 hours was 3.6. Liu Y et al[11] shown that postural stability and motor control are affected by more than 19, 24 or 48 h of sleep deprivation and the effect of sleep deprivation on postural sway were correlated with reduced levels of Alertness.Patel M[12] found that twenty-four hours of sleep deprivation led to the disturbances in postural control which intensified with the duration of sleepless-ness. FabbriMet al[13] gave the possible explanation that the changes in the sensory integration may be concurrent with the visual deficiencies caused by sleep deprivation.

The limitation the study is small sample size.

Conclusion

Authors found that sleep deprivation significantly deteriorates the postural control.

References

1. Thomas M, Sing H, Belenky G, et al: Neural basis of alertness and cognitive performance impair-ments during sleepiness: II. Effects of 24 and 72 h of sleep deprivation on waking human regional brain activity. Thalamus RelatSyst 2003; 2: 199 – 229.
2. Drummond SP, Brown GG, Stricker JL, Buxton RB, Wong EC, Gillin JC. Sleep deprivation-induced reduction in cortical functional response to serial subtraction. Neuroreport. 1999;10 (18):3745-8.
3. Gribble PA, Hertel J. Changes in postural control during a 48-hr. sleep deprivation period. Percept Mot Skills. 2004;99(3 Pt 1):1035-45.
4. Avni N, Avni I, Barenboim E, Azaria B, Zadok D, Kohen-Raz R, Morad Y. Brief posturographic test as an indicator of fatigue. Psychiatry Clin Neurosci. 2006;60(3):340-6.
5. Schlesinger A, Redfern MS, Dahl RE, Jennings JR. Postural control, attention and sleep deprivation. Neuroreport. 1998 ;9(1):49-52.
6. Nardone A, Tarantola J, Galante M, Schieppati M. Time course of stabilometric changes after a strenuous treadmill exercise. Arch Phys Med Rehabil. 1998;79(8):920-4.
7. Nakano T, Araki K, Michimori A, Inbe H, Hagiwara H, Koyama E. Nineteen-hour variation of postural sway, alertness and rectal temperature during sleep deprivation. Psychiatry Clin Neurosci. 2001;55(3):277- 8.
8. Yogi et al. Effect of Sleep Deprivation on Postural Control in Resident Doctors. International Journal of Health and Clinical Research, 2021;4(1):166-169.
9. Friedman RC, Bigger JT, Kornfeld DS. The intern and sleep loss. N Engl J Med. 1971 ;285(4):201-3.
10. Samkoff JS, Jacques CH. A review of studies concerning effects of sleep deprivation and fatigue on residents' performance. Acad Med. 1991; 66(11):687-93.
11. Liu Y, Higuchi S, Motohashi Y. Changes in postural sway during a period of sustained wakefulness in male adults. Occup Med (Lond). 2001;51(8):490-5.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

12. Patel M, Gomez S, Berg S, Almbladh P, Lindblad J, Petersen H, Magnusson M, Johansson R, Fransson PA. Effects of 24-h and 36-h sleep deprivation on human postural control and adaptation. Exp Brain Res. 2008 ;185(2):165-73.
13. Fabbri M, Martoni M, Esposito MJ, Brighetti G, Natale V. Postural control after a night without sleep. Neuropsychologia. 2006;44(12):2520-5.