ORIGINAL PAPER

International Journal of Occupational Medicine and Environmental Health 2015;28(2):305–312
http://dx.doi.org/10.13075/ijomeh.1896.00360

SLEEP HABITS AND ROAD TRAFFIC ACCIDENT RISK FOR IRANIAN OCCUPATIONAL DRIVERS

MOHAMMAD HOSSEIN EBRAHIMI[1], MASOUMEH SADEGHI[2], MOHSEN DEHGHANI[3], and KHOSRO SADEGH NIIAT[4]

[1] Shahroud University of Medical Sciences, Shahroud, Iran
School of Public Health, Department of Occupational Health
[2] Kerman University of Medical Sciences, Kerman, Iran
Research Center for Modeling in Health, Institute for Future Studies in Health
[3] Shahroud University of Medical Sciences, Shahroud, Iran
School of Medicine, Center for Health Related Social and Behavioral Sciences Research
[4] Tehran University of Medical Sciences, Tehran, Iran
Occupational Sleep Research Center

Abstract

Objectives: The aim of this study is to assess the sleep quality and sleep disorders (prevalence of obstructive sleep apnea and sleepiness) among occupational drivers in Iran and to determine which demographic factors and occupational habits are linked to road traffic accidents. **Material and Methods:** In this analytic cross-sectional study 556 occupational road drivers from Shahroud city (in the northeast of Iran) participated, upon a prior verbal informed consent, during 2013–2014. The Pittsburgh Sleep Quality Index (PSQI) standard questionnaire that scored on 7 point scale, the 8-item Epworth Sleepiness Scale (ESS) questionnaire and the 8-question STOP-Bang questionnaire along with demographic information and occupational data were used. To explore the independent factors associated with odds of poor sleep quality and road accident, multiple logistic regression models were used. **Results:** Prevalence of previous road accidents, sleepiness while driving, and obstructive sleep apnea scored ≥ 3 in the study, and drivers accounted for 23.8%, 29%, and 24.8%, respectively. The global mean score of sleep quality and excessive sleepiness score were 5.2 and 4.8, respectively. The main factors related to the odds of poor sleep quality were snoring (odds ratio (OR) = 2.34; 95% confidence interval (CI): 1.15–4.77), smoking (OR = 2.12; 95% CI: 1.15–3.97), and driving times in a day (OR = 1.12; 95% CI: 1.03–1.21). The Epworth Sleepiness Scale (OR = 1.13; 95% CI: 1.07–1.23) and suffering from apnea (OR = 4.89; 95% CI: 1.07–23.83) were the best predictors for odds (increased risk) of road accidents. **Conclusions:** A considerable proportion of Iranian drivers had records of road accidents; poor sleep quality, sleepiness while driving, and sleep disorder breathing (obstructive sleep apnea – OSA). Snoring, smoking, driving time in a day, excessive sleepiness, and presumably apnea increase the odds of poor sleep quality and road traffic accident for Iranian occupational drivers.

Key words:
Sleep habits, Obstructive sleep apnea, Pittsburgh Sleep Quality Index, PSQI, Road accidents, Iran

This work was supported by the funds (Grant No. 9050) from the Vice Chancellor for Research, Shahroud University of Medical Sciences. Grant manager: Mohammad Hossein Ebrahimi, MD, Assistant Professor.
Received: June 21, 2014. Accepted: September 2, 2014.
Corresponding author: M. Sadeghi, Research Center for Modeling in Health, Institute for Future Studies in Health, Kerman University of Medical Sciences, Kerman, Iran (e-mail: sadeghi.masoume@gmail.com).

INTRODUCTION

Road traffic crashes lead to more than 2% of the worldwide mortality and morbidity and is the main cause of death in the age group of 15–29 years old [1,2]. At present road traffic injuries (RTI) account for the 8th leading cause of death in the world [1], and if current trends continue, traffic injuries are estimated to become the 5th leading cause of fatality in 2030 [2]. While most high-income societies had considerable achievements in reducing road traffic injuries and the related death rate during previous decades [3], the RTI mortality rose progressively in a large number of low- and middle-income countries. Estimates demonstrate that 85% of deaths due to road accidents and 95% of disease arising from the RTI occur in low- and middle-income countries [4].

Several factors contribute to the occurrence of road accidents and injuries, including poor quality of sleep and sleepiness while driving. According to studies, sleep habits and related disorders have influence on driving performance and a substantial number of road accidents attributed to poor sleep quality and sleepiness while driving [4–6]. Obstructive sleep apnea (OSA) is a form of sleep disorder that occurs as a result of complete or fractional airway obstruction during sleep, and leads to hypoxemia then the lack of quiet and relaxing sleep [7,8]. It is the most widespread sleep disorder occurring globally [8]. Even the asymptomatic OSA increases morbidity and mortality [9]. Excessive daytime sleepiness (EDS) is one of the leading consequences of the OSA which increases the probability of road traffic crashes and injuries [10]. Daytime sleepiness is assessed using the Epworth Sleepiness Scale (ESS). Iran is a middle-income country where a road traffic accident is the 3rd leading cause of disability and premature death and is recognized as a leading public health concern. According to the currently available estimates, the mortality rate attributed to road crashes in this country is higher than in any other country in the world [11]. Iran represents a great number of road traffic injuries [12,13]. Based on studies conducted in other countries, sleep habits and related disorders account for the major causes of road accidents [4–6,14]. The literature review of the associated evidence suggests the need for further studies in Iran. The objective of this study is to assess the sleep quality and sleep disorders (prevalence of the OSA and sleepiness) among occupational drivers in Iran and to determine which demographic factors and occupational habits are linked to road traffic accidents.

MATERIAL AND METHODS

This was an analytic cross-sectional study. Five hundred fifty-six occupational road drivers as members of the drivers guild office in Shahroud city (in the north-east of Iran) participated, upon a prior verbal informed consent, during 2013–2014. We used the Pittsburgh Sleep Quality Index (PSQI) standard questionnaire scored on 7 point scale, the 8-item Epworth Sleepiness Scale (ESS) questionnaire and the 8-question STOP-Bang questionnaire along with demographic information and occupational data. The questionnaire was managed by educated interviewers.

The PSQI questionnaire was used for the purpose of assessing sleep quality and recognizing sleep disorders. This is a validated 7-component tool, ranging from 0 to 21 score. The PSQI total score greater than 5 is indicative of sleep disorders, and distinguishes persons who enjoy desirable sleep quality from those with poor sleep quality.

The ESS was used for measuring daytime sleepiness. This is a validated 8-item questionnaire that estimates the likelihood of falling asleep in the daytime under a variety of situations (range: 0–24) [15]. The score of 0–8 proved normal, 9–12 proved mild, 13–16 proved moderate, and greater than 16 proved severe or excessive sleepiness. The score higher than 10 on the ESS is generally considered clinically significant [16].

The STOP-Bang questionnaire is a valid tool for screening of the obstructive sleep apnea (OSA) [17]. It is a simple validated 8-item instrument that is indicative of having

snoring, tiredness, observed apnea, a record of high blood pressure, having the body mass index (BMI) > 30, age > 50, neck circumference > 40 cm, and having a male gender identity. Having the total score of 3 and above is regarded as exposure to the high risk of the OSA [18].

The collected data was analyzed using the statistical software SPSS v. 16.0 (SPSS Inc. Chicago, Illinois). The standard deviation of the mean (±) and percent were used to describe the continuous and categorical data respectively. Univariate comparisons were done by t-test and Chi^2 for independent samples for continuous and categorical variables. The multiple logistic regression models were used to explore the independent factors associated with the odds of poor sleep quality and road accidents. In this study $\alpha < 0.05$ was considered to be statistically significant.

RESULTS

A total of 556 drivers participated in the study (only 0.5% of them were female). The majority of drivers (82.1%) were satisfied with their jobs. Baseline characteristics have been illustrated in the Table 1. The mean driving time in a day was 9.86±4.29 h. Daytime, evening, nighttime and rotational time driving was reported by 37.4%, 10% and 52.6%, respectively. Accident records within the last year and the past 5 years were reported by 6.1% and 23.8%, respectively. According to the study population, in 10.9% of all reported accidents, the drivers themselves were at fault and 3.2% of their accidents lead to injury or death.

The mean score on the PSQI was 5.23±2.68 (0–15), and 40% had the PSQI score higher than 5. Among the 7 components of sleep quality, subjective sleep quality posed the highest score (Table 2). Based on the Epworth Sleepiness Scale, the mean ESS was 4.8±3.5 (0–22), 6% of the participants posed the score higher than 10 and 14.5% of them had mild to severe sleepiness. The STOP-Bang mean score was 1.96±1.08 and 24.8% of the participants posed the STOP-Bang score of ≥ 3 (Table 3), which means that nearly 1/4 of the participants were exposed to the high risk for morbidity of the OSA. The demographic and work factors that predicted poor sleep quality and road accident records in the univariate and multivariate logistic regression analysis have been presented in the Table 4.

Table 1. Baseline characteristics of the study group

Variable	Study group (N = 556)
Body mass index (M±SD)	25.29±3.46
Seniority (years) (M±SD)	11.71±8.41
Mean driving time (h/day) (M±SD)	9.86±4.29
Neck circumference (cm) (M±SD)	38.66±3.07
Age (years) [n (%)]	
< 50	453 (83.10)
> 50	95 (17.10)
Sex [n (%)]	
male	553 (99.50)
female	3 (0.50)
Marital status [n (%)]	
single	78 (14.20)
married	472 (85.80)
Level of education [n (%)]	
primary	195 (35.20)
diploma	302 (54.20)
academic	57 (10.30)
History [n (%)]	
road accident during 5 years	120 (23.80)
heart disease	9 (1.60)
hypertension	12 (2.20)
pulmonary disease	3 (0.60)
smoking	86 (15.60)
Job satisfaction [n (%)]	
complete satisfaction	205 (38.50)
fair satisfaction	232 (43.60)
no satisfaction	95 (17.90)
Driving route [n (%)]	
fixed	140 (25.70)
variable	416 (74.30)

M – mean; SD – standard deviation.

Table 2. The Mean of Pittsburgh Sleep Quality Index (PSQI) as broken down into subcomponents

Component	PSQI (M±SD)
Subjective sleep quality	1.78±0.58
Sleep latency	0.72±0.69
Sleep duration	0.85±0.89
Habitual sleep efficiency (%)	0.31±0.75
Sleep disturbances	0.85±0.51
Use of sleep medication	0.08±0.39
Day time dysfunction	0.89±0.82
Total	5.23±2.68

Abbreviations as in Table 1.

Table 3. Sleep parameters of the study group

Parameter	Study group (N = 556)	
	N	%
Sleepiness while driving	158	29.0
Snoring	58	10.7
Sleep apnea	14	2.6
Sleep quality > 5	221	40.0
ESS > 10	33	6.0
STOP-Bang ≥ 3	138	24.8

ESS – Epworth Sleepiness Scale.

Among the rest of the factors associated with the increased risk for poor sleep quality; snoring (OR = 2.34; 95% CI: 1.15–4.77), smoking (OR = 2.12; 95% CI: 1.15–3.97), and driving times in a day (OR = 1.12; 95% CI: 1.03–1.21) were the leading predictors in both the univariate and the multiple logistic regression model (Table 4). It means that being a smoker, snoring, and longer work time result in greater odds of poor sleep quality. The most important factors related to the increased risk (odds ratio) for road accident records in the univariate regression model were smoking (OR = 1.72; 95% CI: 1.02–2.90), the STOP-Bang score (OR = 1.30; 95% CI: 1.01–1.55), the ESS score (OR = 1.13; 95% CI: 1.07–1.23), and the sleep quality score (OR = 1.14; 95% CI: 1.06–1.23). However, in the multiple logistic regression models with controlling of confounding variables; the ESS and suffering from apnea were best the predictors for the odds (the increased risk) of road accidents (Table 4).

DISCUSSION

Because of the outstanding relevance between sleep habits and road accident risk and frequent occurrence of road traffic accidents in Iran, this study aimed to assess the sleep quality and sleep disorders and explore the demographic and occupational factors influencing road traffic accidents. The mean global score on the PSQI was 5.23±2.68 and 40% of the participants had poor sleep quality. These findings were consistent with other studies [19–23].

Among subcomponent scores, subjective sleep quality and habitual sleep efficiency had the maximum mean and minimum score, respectively. In this term similar studies had different findings that could be attributed to a wide range of influencing factors in sleep quality [24–26]. This suggests that different societies have different perception of sleep and related disorders [26].

The mean ESS score of the whole study population was 4.8±3.5 and mild to severe sleepiness was common for 14.5% of them. Only 6% of the participants posed the ESS scores above 10, which means that the prevalence of excessive daytime sleepiness (EDS) was 6%. More than 24% of the participants were exposed to the high risk of the OSA. However, in similar studies conducted in other societies (Lagos metropolis; Nigeria and Edinburgh; Scotland), the prevalence of the EDS and the risk of the OSA was still higher [27–29]. The variation in the prevalence of the EDS and the risk of the OSA in different studies is inevitable because of different methodology, sample size, socio-economic and cultural characteristics of the study population [30]. For instance in some studies, drivers were selected from a secluded area

Table 4. Personal and occupational risk factors for poor sleep quality and road accidents within the past 5 years based on the multiple logistic regression model

Variable	Poor sleep quality				Road accident in past 5 years			
	crude		adjusted		crude		adjusted	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Age (years)								
< 50 (reference)	–	–	–	–	–	–	–	–
> 50	1.41 (0.90–2.21)	0.13	0.60 (0.25–1.45)	0.26	1.18 (0.69–1.99)	0.54	0.32 (0.10–1.06)	0.06
Body mass index	1.04 (0.99–1.09)	0.15	1.00 (0.92–1.07)	0.80	0.98 (0.92–1.05)	0.60	0.95 (0.87–1.05)	0.29
Smoking (yes/no)	2.38 (1.49–3.80)	< 0.001	2.12 (1.13–3.97)	0.02*	1.72 (1.02–2.90)	0.04	1.16 (0.54–2.48)	0.70
Driving time in a day	1.14 (1.06–1.22)	< 0.001	1.12 (1.03–1.21)	0.006*	1.07 (1–1.16)	0.05	1.03 (0.97–1.09)	0.38
Shift work								
morning (reference)	–	–	–	–	–	–	–	–
evening and night	0.99 (0.5–1.91)	0.98	0.71 (0.26–1.93)	0.51	1.09 (0.50–2.49)	0.82	1.09 (0.37–3.23)	0.88
Rotational	1.70 (1.16–2.51)	0.007	1.47 (0.86–2.51)	0.16	1.63 (1–1.05)	0.09	1.14 (0.59–2.19)	0.69
Experience	1.02 (0.99–1.42)	0.13	1.01 (0.97–1.06)	0.56	1.02 (1–1.05)	0.09	1.03 (1.0–1.11)	0.05*
Driving route	0.95 (0.64–1.40)	0.78	0.79 (0.46–1.38)	0.41	0.80 (0.49–1.23)	0.28	0.77 (0.39–1.49)	0.43
Snoring (yes/no)	2.53 (1.45–4.42)	0.001	2.34 (1.15–4.77)	0.02*	1.70 (0.91–3.17)	0.09	1.31 (0.84–2.06)	0.78
Apnea (yes/no)	3.97 (1.23–12.81)	0.02	1.28 (0.22–7.36)	0.79	2.49 (0.85–7.34)	0.10	4.89 (1.07–23.83)	0.05*
STOP-Bang score					1.30 (1.08–1.55)	0.004	0.71 (0.25–2.07)	0.53
Epworth Sleepiness Scale score					1.13 (1.07–1.20)	< 0.001	1.17 (1.08–1.27)	< 0.001*
Sleep quality score					1.14 (1.06–1.23)	< 0.001	1.31 (0.84–2.66)	0.78

OR – odds ratio; CI – confidence interval.
* Significant at $p < 0.05$.

or participants were not selected at random, so consequently study samples may not be representative of the whole population of drivers [31,32].

We found that snoring, smoking and driving time in a day were associated with poor sleep quality. In fact, these factors in a driver increase the odds of occurrence of low sleep quality. According to a number of studies, various internal and external factors may be associated with sleep quality [33,34]. In our study 52.6% of the participants reported rotational/shift work. However, this finding was inconsistent with other studies that were conducted in a variety of countries [30,34]. It may be related to different working conditions and socio-economic status in different countries. Shift work is a commonly complicating issue amongst drivers. We found that rotational/shift work is significantly associated with poor sleep quality in the univariate analysis, but in the presence of other factors (in the multiple model) its effect is diminished.

Our results showed that each unit o the growth rate in the ESS score makes the odds of road accidents higher by about 17%. The literature review showed that there was controversy in this case. Several authors confirmed our findings and claimed that the ESS > 10 was the risk factor for road accidents in drivers [35], on the other hand some studies did not find significant relations between the high ESS and the risk of accidents [36]. According to studies, sleep habits and related disorders have influence on driving performance and a substantial number of road accidents is attributed to poor sleep quality and sleepiness while driving [4–6]. However, in the multiple models our findings showed that the sleep quality score is not significantly associated with the risk of road accidents in drivers. The major reasons for this controversy are that the global mean score of sleep quality in our study population is closed to discriminate the cut-off point.

Other less worrying factors that cause traffic accidents were apnea, years of experience, and age > 50 years old. In the multiple logistic regression analyses, the odds ratio related to apnea was estimated to stand at 4.89 (95% CI: 1.07–23.83), however there was the statistical borderline ($p = 0.05$). It may be due to the low percentage of drivers with records of apnea in this study. Since in this study, the sleep apnea was discovered using questionnaire instead of diagnostic testing, therefore it is important that interpretation about the presence of sleep apnea and its borderline effects on road accidents should be drawn with caution.

CONCLUSIONS

Our findings indicate that nearly 1/4 of occupational drivers had road accident records. Furthermore 29% of them expressed sleepiness while driving. We found the high prevalence of poor sleep quality (40%) and sleep disorder breathing. The main factors related to the odds of poor sleep quality were snoring, smoking, and driving time in a day. Excessive sleepiness and likely apnea increased the risk of road accidents for occupational drivers. As most of the factors related to the poor sleep quality and road accidents are modifiable factors, therefore it is necessary to develop interventional programs that focus on sleep habits and screening sleep disorders.

ACKNOWLEDGMENTS

The authors would like to thank Mrs. Mina Shayesteh for data collection and all of the participants who helped to conduct this study.

REFERENCES

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380(9859):2095–128, http://dx.doi.org/10.1016/S0140-6736(12)61728-0.
2. World Health Organization. The global burden of disease: 2004 update. Geneva: WHO; 2008.

3. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization; 2004.
4. Phillips RO, Sagberg F. Road accidents caused by sleepy drivers: Update of a Norwegian survey. Accid Anal Prev. 2013;50:138–46, http://dx.doi.org/10.1016/j.aap.2012.04.003.
5. Nordbakke S, Sagberg F. Sleepy at the wheel: Knowledge, symptom and behaviour among car drivers. Transp Res. 2007;10(1):1–10, http://dx.doi.org/doi:10.1016/j.trf.2006.03.003.
6. Komada Y, Asaoka S, Abe T, Inoue Y. Short sleep duration, sleep disorders, and traffic accidents. IATSS Research. 2013;37(1):1–7, http://dx.doi.org/10.1016/j.iatssr.2013.06.001.
7. Kendzerska T, Gershon AS, Hawker G, Leung RS, Tomlinson G. Obstructive sleep apnea and risk of cardiovascular events and all-mortality cause: A decade-long historical cohort study. PLoS Med. 2014;11(2):e1001599, http://dx.doi.org/10.1371/journal.pmed.1001599.
8. Lam JCM, Sharma SK, Lam B. Obstructive sleep apnea: Definitions, epidemiology & natural history. Indian J Med Res. 2010;131:165–70.
9. Marshall NS, Wong KK, Liu PY, Cullen SR, Knuiman MW, Grunstein RR. Sleep apnea as an independent risk factor for all-cause mortality: The Busselton Health Study. Sleep. 2008;31(8):1079–85.
10. Goldstein IB, Ancoli-Israel S, Shapiro D. Relationship between daytime sleepiness and blood pressure in healthy older adults. Am J Hypertens. 2004;17(9):787–92, http://dx.doi.org/10.1016/j.amjhyper.2004.05.009.
11. Bhalla K, Naghavi M, Shahraz S, Bartels D, Murray CJL. Building national estimates of the burden of road traffic injuries in developing countries from all available data sources. Iran Inj Prev. 2009;15(3):150–6, http://dx.doi.org/10.1136/ip.2008.020826.
12. Naghavi M, Abolhassani F, Pourmalek F, Lakeh M, Jafari N, Vaseghi S, et al. The burden of disease and injury in Iran 2003. Popul Health Metr. 2009;7(9), http://dx.doi.org/10.1186/1478-7954-7-9.
13. Nghavi M, Shahraz S, Bhalla K, Jafari N, Pourmalek F, Bartels D, et al. Adverse health outcomes of road traffic injuries in Iran after rapid motorization. Ach Iran Med. 2009;12(3):284–94.
14. Pandi-Perumall SR, Verster JC, Kayumov L, Lowe AD, Santana MG, Pires MLN, et al. Sleep disorders, sleepiness and traffic safety: A public health menace. Braz J Med Biol Res. 2006;39(7):863–71, http://dx.doi.org/10.1590/S0100-879X2006000700003.
15. John MW. A new method to measure daytime sleepiness: The Epworth Sleepiness Scale. Sleep. 1991;14(6):540–5.
16. Walsleben JA, Kapur VK, Newman AB, Shahar E, Bootzin RR, Rosenberg CE, et al. Sleep and reported daytime sleepiness in normal subjects: The Sleep Heart Health Study. Sleep. 2004;27(2):293–8.
17. Abrishami A, Khajehdehi A, Chung F. A systematic review of screening questionnaire for obstructive sleep apnoea. Can J Anaesth. 2010;57(5):423–38, http://dx.doi.org/10.1007/s12630-010-9280-x.
18. Chung F, Yegneswaran B, Liao P, Chung SA, Viaravanathan S, Islam S, et al. STOP questionnaire: A tool to screen patients with obstructive sleep apnea. Anesthesiology. 2008;108(5):812–21, http://dx.doi.org/10.1097/ALN.0b013e31816d83e4.
19. Hasanzadeh H, Alavi K, Ghalebandi MF, Yadolahi Z, Gharaei B, Sadeghikia A. [Sleep quality in Iranian drivers recognized as responsible for severe road accidents]. J Res Behav Sci. 2008;6(2):97–107. Persian.
20. Braeckman L, Verpraet R, van Risseghem M, Pevernagie D, de Bacquer D. Prevalence and correlates of poor sleep quality and daytime sleepiness in Belgian truck drivers. Chronobiol Int. 2011;28(2):126–34, http://dx.doi.org/10.3109/07420528.2010.540363.
21. Halvani GH, Jafari Nodoushan R, Nadjarzadeh A. Relation between accidents and sleep quality of vehicle drivers in Yazd. Int J Env Health Eng. 2012;1(40):40–3, http://dx.doi.org/10.4103/2277-9183.102374.

22. Buysse DJ, Hall ML, Strollo PJ, Kamarck TW, Owens J, Lee L, et al. Relationships between the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and clinical/polysomnographic measures in a community sample. J Clin Sleep Med. 2008;4(6):563–71.
23. Knutson KL, Rathouz PJ, Yan LL, Liu K, Lauderdale DS. Stability of the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Questionnaires over 1 year in early middle-aged Adults: The CARDIA study. Sleep. 2006;29(11): 1503–6.
24. Asghari A, Farhadi M, Kamrava MK, Ghalehbaghi B, Nojomi M. Subjective sleep quality in urban population. Arch Iran Med. 2012;15(2):95–8.
25. Doi Y, Minowa M, Uchiyama M,Okawa M. Subjective sleep quality and sleep problems in the general Japanese adult population. Psychiatry Clin Neurosci. 2001;55(3): 213–5, http://dx.doi.org/10.1046/j.1440-1819.2001.00830.x.
26. Aloba OO, Adewuya AO, Ola BA, Mapayi BM. Validity of the Pittsburgh Sleep Quality Index (PSQI) among Nigerian university students. Sleep Med. 2007;8(3):266–70, http://dx.doi.org/10.1016/j.sleep.2006.08.003.
27. Pérez-Chada D, Videla AJ, O'Flaherty ME, Palermo P, Meoni J, Sarchi MI, et al. Sleep habits and accident risk among truck drivers: A cross-sectional study in Argentina. Sleep. 2005;28(9):1103–8.
28. Ozoh OB, Okubadejo NU, Akanbi MO, Dania MG. High-risk of obstructive sleep apnea and excessive daytime sleeping among commercial intra-city drivers in Lagos metropolis. Niger Med J. 2013;54(4):224–9, http://dx.doi.org/10.4103/0300-1652.119607.
29. Vennelle M, Engleman HM, Douglas NJ. Sleepiness and sleep related accidents in commercial bus drivers. Sleep Breath. 2010;14(1):39–42, http://dx.doi.org/10.1007/s11325-009-0277-z.
30. Souza JC, Paiva T, Reimão R. Sleep habits, sleepiness and accidents among truck drivers. Arq Neuro-Psiquiatr. 2005;63(4):925–30, http://dx.doi.org/10.1590/S0004-282X2005000600004.
31. Stoohs RA, Bingham LA, Itoi A, Guilleminault C, Dement WC. Sleep and sleep-disordered breathing in commercial long-haul truck drivers. Chest. 1995;107(5):1275–82, http://dx.doi.org/10.1378/chest.107.5.1275.
32. Hui D, Chan J, Ko F, Choy D, Li T, Chan A, et al. Prevalence of snoring and sleep-disordered breathing in a group of commercial bus drivers in Hong Kong. Intern Med J. 2002;32(4):149–57, http://dx.doi.org/10.1046/j.1444-0903.2001.00196.x.
33. Kezirian EJ, Harrison SL, Ancoli-Israel S, Redline S, Ensrud K, Goldberg AN, et al. Behavioral correlates of sleep-disordered breathing in older men. Sleep. 2009;32(2): 253–61.
34. Häkkänen J, Summala H. Fatal traffic accidents among trailer truck drivers and accident causes as viewed by other truck drivers. Accid Anal Prev. 2001;33(2):187–96, http://dx.doi.org/10.1016/S0001-4575(00)00030-0.
35. Catarino R, Spratley J, Catarino I, Lunet N, Pais-Clemente M. Sleepiness and sleep-disordered breathing in truck drivers. Sleep Breath. 2014;18(1):59–68, http://dx.doi.org/10.1007/s11325-013-0848-x.
36. Masa JF, Rubio M, Findley LJ. Habitually sleepy drivers have a high frequency of automobile crashes associated with respiratory disorders during sleep. Am J Respir Crit Care Med. 2000;162(4):1407–12, http://dx.doi.org/10.1164/ajrccm.162.4.9907019.