

## Cigarette Smoking Habit and Subjective Quality of Sleep

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**Background:** Cigarette smoking habit is a physical addiction to nicotine that has long been regarded as one of the most important risk factors of several diseases, especially heart and lung diseases, and particularly lung cancers.

**Objectives:** This study was conducted to assess the effect of cigarette smoking on subjective sleep quality according to Pittsburgh Sleep Quality Index (PSQI) and its components.

**Patients and Methods:** This is a cross-sectional study conducted on 2923 individuals aged between 18 and 98 years in Tehran province, Iran, to evaluate the effect of cigarette smoking on sleep quality. Night-shift workers were not included in the study. Participants were divided into two groups according to the current or noncurrent cigarette smoking habit. Sleep quality was compared between groups using 7 components of Pittsburgh Sleep Quality Index (PSQI) and its global score.

**Results:** Data of 2923 individuals comprised of 1638 (56%) females and 1285 (44%) males with a mean age of  $43.68 \pm 17.74$  years (aged 18-98 years) were analyzed. Out of 2923 participants, 308 cases (10.5%) were current cigarette smokers and 2615 (89.5%) were not current smokers. Three out of seven PSQI components comprising sleep quality, duration, and sedative medication use, in addition to global PSQI score were significantly poorer in the current smokers compared to nonsmokers ( $P = 0.013, 0.036, 0.001, \text{ and } 0.010$ , respectively). Among current smokers, PQSI increased significantly with the number of cigarettes smoked per day (Pearson's correlation coefficient  $r = 0.122, P = 0.036$ ).

**Conclusions:** PQSI global score reflecting sleep quality was poorer in the individuals with a history of one-month cigarette smoking. It means that even one month of cigarette smoking could significantly decrease the quality of sleep and still could be worsen with increasing the number of cigarettes smoked per day.

**Keywords:** Sleep Disorders; Smoking; Habit

### 1. Background

Cigarette smoking habit is a physical addiction to nicotine that has long been regarded as one of the most important risk factors of several diseases, especially heart and lung diseases, and particularly lung cancers (1-3). In recent years, several studies have focused on cigarette smoking, which revealed its direct or indirect toxicity effects on all body organs and their consequences comprising of different kind of diseases such as cardiovascular, lung, liver, Hodgkin and non-Hodgkin diseases, cancers and a variety of disorders, particularly sleep disturbances (1, 3-9).

Sleep disturbance is as important as other consequences, since it could lead to cardiovascular and cerebrovascular diseases resulting in difficulty in concentration, memory, mood disorders, and diminishing the quality of life (10-12). There are lots of studies regarding association of smoking habits with various aspects of the sleep disorders like sleeping duration, latency, efficiency, continuity, and quality (8, 13-16). However, despite all these efforts, the effects of cigarette smoking on general sleep quality are not well characterized, particularly according to the sleep quality indices.

### 2. Objectives

This study was conducted to evaluate the effect of current cigarette smoking habit on subjective sleep quality according to Pittsburgh Sleep Quality Index (PSQI).

### 3. Materials and Methods

#### 3.1. Study Population

This is a cross-sectional study conducted on 2923 adult urban individuals (age range, 18-98 years) who were extracted from our previous survey of sleep quality during May 2008 to February 2009 (17). The target population of the survey comprised of urban individuals aged 18 years or older residing in Tehran Province, Iran. Participants were asked to answer Pittsburgh Sleep Quality Index (PSQI) and validate Persian version of this questionnaire (18-20). The study was conducted to evaluate the effect of current cigarette smoking on sleep disorder according to PSQI (Persian version of this questionnaire) (18-21). The study was approved by the Institutional Ethics Committee of the Rasool Akram Hospital Research Center and Iran University of Medical Sciences and written in-

formed consent was obtained from all of contributors. Individuals with a history of smoking habits with other substances or any drug abuses, night-shift workers, and those with missing data of smoking habit excluded from the study. A total of 2923 cases were divided into 2 groups according to the history of cigarette smoking during the past month: current smokers group and noncurrent smoker group. Basic characteristics, PSQI score and its 7 components were evaluated and compared between the 2 groups. Also PSQI score was compared among current smokers according to the number of cigarettes smoked per day.

### 3.2. Pittsburgh Sleep Quality Index (PSQI)

PSQI assessment is based on 7 clinical components of sleep quality, latency, duration, efficiency; disturbances, daytime dysfunction, and sedative medication use (17-20). Scoring of each component is based on a 0 to 3 scale that 0 reflects the positive extreme, and 3 reflects the negative extreme. A global PSQI sum of 5 or greater indicates a poor sleeper.

### 3.3. Current Cigarette Smoking Habit

Current cigarette smoking was defined as a person, 18 years and older, who started the habit or continued it during the last month and smoked every day or someday during the last month. The number of cigarettes smoked per day were also recorded and entered into the analysis.

### 3.4. Statistical Analysis

Data are presented as number (%) and means  $\pm$  SD. The Univariate analyses of the continuous and categorical variables were calculated using Student t-tests and chi-square test. Analysis of covariance (ANCOVA) was used to adjust confidential variables such as sex, age, and history of the disease. An analysis of linear regression and the coefficient of linear correlation of Pearson were used to

show the correlation between the number of cigarettes smoked per day and PSQI score.  $P \leq 0.05$  was considered significant. Statistical analysis was performed using SPSS 17 for Windows (SPSS Inc., Chicago, Illinois).

## 4. Results

The study included 2923 individuals with a mean age of  $43.68 \pm 17.74$  years (aged 18 to 98 years old) and comprised of 1638 (56%) female and 1285 (44%) male cases. Of 2923 participants, 308 cases (10.5%) were current cigarette smokers and 2615 (89.5%) ones were not current smoker. Current cigarette smokers were significantly older than nonsmokers ( $47.30 \pm 15.24$  vs.  $43.25 \pm 17.96$  y,  $P = 0.001$ ). Among 308 current cigarette smokers 266 cases (86.4%) were male, but in nonsmokers, 1019 (39%) participants were male ( $P = 0.001$ ). The average years of education was slightly higher in nonsmokers; however, it was not significantly different between the two groups (nonsmokers  $10.08 \pm 4.96$  years vs. current smokers  $10.02 \pm 4.58$  years,  $P = 0.831$ ). Current smokers were more occupied when compared to the nonsmokers (169 cases (57.9%) vs. 701 (28.1%),  $P = 0.001$ ). Characteristics of the both groups are shown in Table 1. There were no significant differences between the 2 groups according to the history of allergy, heart and lung diseases, and hypertension ( $P = 0.062$ ,  $0.768$  and  $0.245$ , respectively). We evaluated and compared PSQI score and its components between the groups that are shown in detail in Table 2. Three of seven components comprising sleep quality, duration, and sedative medication use, in addition to global PSQI score were significantly higher (poorer) in the current smokers than nonsmokers ( $P = 0.013$ ,  $0.036$ ,  $0.001$ , and  $0.010$ , respectively). Even after adjusting sex, age, and history of the diseases through ANCOVA analysis, the global PSQI score was still significantly higher (poorer) in the current smokers ( $\beta = -1234$ ). In the current smokers group, PQSI increased significantly with the number of cigarettes smoked per day (Pearson's correlation coefficient  $r = 0.122$ ,  $P = 0.036$ ).

**Table 1.** Basic Characteristics of the Two Groups <sup>a</sup>

Characteristics	Nonsmokers (n = 2615)	Cigarette smokers (n = 308)	P Value
Age,y	43.25 $\pm$ 17.96	47.30 $\pm$ 15.24	0.001
Gender			0.001
Male	1019 (39)	266 (86.4)	
Female	1596 (61)	42 (13.6)	
Years of education	10.08 $\pm$ 4.96	10.02 $\pm$ 4.58	0.831
Occupied	701 (28.1)	169 (57.9)	0.001
Allergy	406 (15.7)	35 (11.6)	0.062
Heart and lung diseases	295 (11.3)	33 (10.7)	0.768
Hypertension	414 (15.8)	41 (13)	0.245

<sup>a</sup> Data are presented as Mean  $\pm$  SD or No.(%).

**Table 2.** Comparison of Pittsburgh Sleep Quality INDEX and Components Between Smoker and Nonsmokers <sup>a,b</sup>

Characteristic	Nonsmokers (n = 2615)	Cigarette Smokers (n = 308)	P Value
Sleep quality	0.85 ± 0.73	0.96 ± 0.81	0.013
Sleep latency	1.24 ± 1.06	1.37 ± 1.12	0.071
Sleep duration	0.82 ± 0.90	0.94 ± 0.90	0.036
Sleep efficiency	0.16 ± 0.51	0.22 ± 0.62	0.142
Sleep disturbances	1.05 ± 0.48	1.07 ± 0.47	0.543
Sedative medication Use	0.31 ± 0.84	0.51 ± 1.05	0.001
Daytime dysfunction	1.03 ± 1.00	0.99 ± 1.01	0.547
Global PSQI	5.20 ± 3.31	5.77 ± 3.65	0.010

<sup>a</sup> PSQI, Pittsburgh Sleep Quality Index.

<sup>b</sup> Data are presented as mean ± SD.

## 5. Discussion

Sleep disorder with an incidence rate of 10% to 40% is one of most common problems over the world that adult people suffer from (17). Several studies focused on the sleep disorder and its various aspects such as sleeping duration, latency, efficiency, continuity, and quality and its risk factors like cigarette smoking habits. However, to the best of our knowledge, there is no study about assessing the effect of cigarette smoking on sleep quality using PSQI (18). PSQI has been regarded as the best proficient subjective assessment tool to measure the quality and patterns of sleep in adults who suffer from different kind of sleep disturbances. Its evaluation is based on 7 clinical components of sleep quality, latency, duration, efficiency, disturbances, daytime dysfunction, and sedative medication use.

There are lots of studies regarding the association of smoking habits with various aspects and subtypes of the sleep disorders and quality (8, 14-16, 21-23). Mak et al. (22) and Phillips and colleagues (23) reported that smokers have more difficulty in going to sleep, staying asleep, awakening early morning, and daytime sleepiness. Likewise, Nakata et al. (14) showed that current smokers suffer from various subtypes of sleep disorders. In another study by Zhang et al. (15), polysomnography study showed that cigarette smoking could disturb sleep architecture by increasing sleep latency and a shift toward lighter stages of sleep. Sahlin et al. (8) also showed that smoking habit had an effect on diminishing quality of life in women.

Our results are consistent with all of the above-mentioned studies by representing that subjective quality of sleep is significantly poorer in the current smokers. The study showed that 3 out of 7 PSQI components of sleep quality, duration, and sedative medication use were significantly poorer in the current smokers compared to nonsmokers ( $P = 0.013$ ,  $0.036$ , and  $0.001$ , respectively). Also, it showed that the global PSQI score was poorer in the current smokers ( $P = 0.010$ ). PSQI global score reflects general subjective sleep quality. According to our knowl-

edge, it is the first time that the association of sleep quality and smoking habit has assessed using global PSQI score. The present study showed that PSQI global score was statistically different and poorer in the individuals with a history of cigarette smoking in the past month i.e. current cigarette smoking could significantly decrease quality of sleep. Furthermore, as the linear regression test showed, sleep quality or in other words PSQI score, still could be worsen with increasing the number of cigarettes smoked per day (Pearson's correlation coefficient  $r = 0.153$ ,  $P = 0.005$ ). Regarding sex, there were significantly less female participants in the smoker group (13.6% vs. 61%). But it could not confound the result as we previously demonstrated (17) female gender itself is an aggravating factor for sleep quality that was in lesser amount in this group. However, we suggest further case-matched studies to eliminate the confounding factors as much as possible.

In conclusion, sleep quality in terms of PSQI global score was poorer in the current cigarette smokers. It means that the quality of sleep can be affected by even one month of cigarette smoking and could be worsen with increasing the number of cigarettes smoked per day.

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## References

1. Cop-Blazic N, Zavoreo I. There is no healthy level of smoking. *Acta Clin Croat.* 2009;**48**(3):371-6.
2. Escobar-Chavez JJ, Dominguez-Delgado CL, Rodriguez-Cruz IM. Targeting nicotine addiction: the possibility of a therapeutic vaccine. *Drug Des Devel Ther.* 2011;**5**:211-24.
3. Kengne AP, Nakamura K, Barzi F, Lam TH, Huxley R, Gu D, et al. Smoking, diabetes and cardiovascular diseases in men in the Asia Pacific region. *J Diabetes.* 2009;**1**(3):173-81.
4. Nakamura K, Barzi F, Lam TH, Huxley R, Feigin VL, Ueshima H, et al. Cigarette smoking, systolic blood pressure, and car-

- diovascular diseases in the Asia-Pacific region. *Stroke*. 2008; **39**(6):1694-702.
5. Jo J, Kimm H, Yun JE, Lee KJ, Jee SH. Cigarette smoking and serum bilirubin subtypes in healthy Korean men: the Korea Medical Institute study. *J Prev Med Public Health*. 2012; **45**(2):105-12.
  6. Briggs NC, Hall HI, Brann EA, Moriarty CJ, Levine RS. Cigarette smoking and risk of Hodgkin's disease: a population-based case-control study. *Am J Epidemiol*. 2002; **156**(11):1011-20.
  7. Schollkopf C, Smedby KE, Hjalgrim H, Rostgaard K, Gadeberg O, Roos G, et al. Cigarette smoking and risk of non-Hodgkin's lymphoma—a population-based case-control study. *Cancer Epidemiol Biomarkers Prev*. 2005; **14**(7):1791-6.
  8. Sahlin C, Franklin KA, Stenlund H, Lindberg E. Sleep in women: Normal values for sleep stages and position and the effect of age, obesity, sleep apnea, smoking, alcohol and hypertension. *Sleep Med*. 2009; **10**(9):1025-30.
  9. Perriot J, Underner M, Doly-Kuchcik L. [Smoking: what are the health risks?]. *Rev Prat*. 2012; **62**(3):333-6.
  10. Ancoli-Israel S, Ayalon L, Salzman C. Sleep in the elderly: normal variations and common sleep disorders. *Harv Rev Psychiatry*. 2008; **16**(5):279-86.
  11. Underner M, Paquereau J, Meurice JC. Cigarette smoking and sleep disturbance. *Rev Mal Respir*. 2006; **23**(3):6567-77.
  12. Asghari A, Mohammadi F, Kamrava SK, Tavakoli S, Farhadi M. Severity of depression and anxiety in obstructive sleep apnea syndrome. *Eur Arch Otorhinolaryngol*. 2012; **269**(12):2549-53.
  13. Redline S, Kirchner HL, Quan SF, Gottlieb DJ, Kapur V, Newman A. The effects of age, sex, ethnicity, and sleep-disordered breathing on sleep architecture. *Arch Intern Med*. 2004; **164**(4):406-18.
  14. Nakata A, Takahashi M, Haratani T, Ikeda T, Hojou M, Fujioka Y, et al. Association of active and passive smoking with sleep disturbances and short sleep duration among Japanese working population. *Int J Behav Med*. 2008; **15**(2):81-91.
  15. Zhang L, Samet J, Caffo B, Punjabi NM. Cigarette smoking and nocturnal sleep architecture. *Am J Epidemiol*. 2006; **164**(6):529-37.
  16. Sabanayagam C, Shankar A. The association between active smoking, smokeless tobacco, second-hand smoke exposure and insufficient sleep. *Sleep Med*. 2011; **12**(1):7-11.
  17. Asghari A, Farhadi M, Kamrava SK, Ghalebaghi B, Nojomi M. Subjective sleep quality in urban population. *Arch Iran Med*. 2012; **15**(2):95-8.
  18. Buysse DJ, Reynolds CF, 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989; **28**(2):193-213.
  19. Shahidi J, Khodabakhshi R, Yahyazadeh SH. Quality of sleep in cancer patients: evidence from Persian translation of Pittsburgh Sleep Quality Index. *Austral Asian J Cancer*. 2007; **6**:165-8.
  20. Malakouti SK, Foroughan M, Nojomi M, Ghalebani MF, Zandi T. Sleep patterns, sleep disturbances and sleepiness in retired Iranian elders. *Int J Geriatr Psychiatry*. 2009; **24**(11):1201-8.
  21. Kashefi Z, Mirzaei B, Shabani R. he Effects of Eight Weeks Selected Aerobic Exercises on Sleep Quality of Middle-Aged Non-Athlete Females. *Iran Red Crescent Med J*. 2014; **16**(7).
  22. Mak KK, Ho SY, Thomas GN, Lo WS, Cheuk DK, Lai YK, et al. Smoking and sleep disorders in Chinese adolescents. *Sleep Med*. 2010; **11**(3):268-73.
  23. Phillips BA. Cigarette Smoking and Sleep Disturbance. *Arch Intern Med*. 1995; **155**(7):734-7.