

Sleep Quality of Professional Firefighters

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ABSTRACT

Background: Firefighting is a unique job with contradictory demands that expose firefighters to many well documented causal factors of sleep debt, but no studies in Iran and only a few worldwide studies have investigated their sleep quality while sleep problems may lead to catastrophes especially in critical service workers. The aim of this study is to evaluate sleep quality and its related factors among a sample of professional Iranian firefighters.

Methods: Using simple random sampling method in a cross-sectional study, 427 personnel of fire and rescue service were invited. They completed the Persian version of Pittsburgh Sleep Quality Index (PSQI) and a data collection sheet about their demographic and occupational features during an individual face to face interview in central office and firehouses throughout Tehran. Response rate was 88.7%.

Results: The mean \pm SD global PSQI score was 7.97 ± 3.77 . Sleep latency was the component of PSQI with the greatest degree of abnormality. 69.9% of participants were poor sleepers. Interestingly, we found no significant differences between sleep quality of shift workers and non shift workers. Using multiple logistic regression analysis, only having another job, smoking and years of job experience were predictors of poor sleep.

Conclusions: In comparison with adult population of Tehran, sleep quality deterioration is notably more common in Tehran firefighters which require health promotion interventions to prevent its serious adverse outcomes.

Keywords: Firefighters, pittsburgh sleep quality index, shift working, sleep quality

INTRODUCTION

Approximately 3100 professional firefighters from 4000 career personnel of Tehran fire and rescue service work in a 24/48 shift schedule. Previous researches have well documented the adverse effects of shift-working, specially very long shifts (>16 h), on sleep quality.^[1-3] Firefighting is a job that exposes workers to job stress.^[4,5] Nowadays we know that job stress can lead to a high prevalence of sleep problems;^[6,7] insomnia may lead to depression and weakened job performance; which, in a cyclical

manner, increases job stress.^[8] In a study on Tehran firefighters, this job was classified as active,^[9] but many worldwide studies classified firefighting as high strain according to Karasek model.^[10,11]

There are a few reports on sleep quality of firefighters.^[12,13] According to these studies, 59% of the US professional firefighters and more than 70% of Changhua firefighters in China had poor sleep quality. In contrast with nurses, sleep researches in other services such as fire protection is limited^[14] especially in Iran.

In addition to personal life, the impact of decreased sleep quality on job performance is notable.^[15] Undiagnosed and untreated sleep disorders can lead to catastrophes, especially in areas that require a rapid response time such as firefighting. The purpose of this study is to evaluate sleep quality and its related factors among professional firefighters of Tehran, the capital of Iran.

METHODS

This cross-sectional study was conducted in Tehran fire and rescue service. For a 95% confidence interval, a prevalence estimation of at least 60%^[12,13] and 5% difference from the expected prevalence, the sample size was estimated approximately 370. We received the list of firefighters and selected 427 of them using simple random sampling. A trained researcher met them at firehouses and central office of the organization to explain the aim of research and answered their questions. He emphasized on the voluntary nature of study and asked them to sign written informed consent. For those who were not at work during the first visit, we scheduled another appointment. The research protocol was approved by the ethics committee of Tehran University of Medical Sciences.

During an individual face-to-face interview in a private room, the researcher asked each precipitant to complete a questionnaire which had two different parts. The first part contained some demographic and occupational data, as seen in Table 1, and the second part was the Persian version of Pittsburgh Sleep Quality Index (PSQI). The original English scale has been showed as a valuable instrument to measure the quality and patterns of sleep^[16] and a recent study validated the Persian version.^[17] The PSQI distinguishes between poor and good sleep by measuring seven items over the last month, as

seen in Table 2. Scoring of the answers is based on a 0 to 3 scale for each item, where 3 reflects the negative extreme on the Likert Scale; therefore, the total score or global PSQI score could be within a range of 0 to 21. A global PSQI score >5 indicates a poor sleep quality.

The data was analyzed using version 20 of the SPSS. Other than descriptive analysis, we used independent samples *t*-test, analysis of variance, Chi square and logistic regression to contrast clinical and demographic features of participants. The significance level was set at a level of $P < 0.05$.

RESULTS

330 of the 357 invited personnel of firehouses and 49 of the 70 personnel in central office participated in our study (Response Rate = 92.4% and 70.0% respectively). Total response rate was 88.7%. Table 1 demonstrates the characteristics and sleep habits of participants. Median (range) of mission's number in the selected firehouses was 33.50 (13 to 140) in the last month, where only 5.00 (2 to 19) of them were between 24 to 6 am while firehouses had attended to very more calls.

265 (69.9%) of participants were poor sleepers (global PSQI > 5). The prevalence of poor sleep quality among shift workers and non shift workers is shown in Figure 1. The difference between the two groups was not significant.

Components of Pittsburgh Sleep Quality Index (PSQI) among participants are shown in Table 2.

Mean \pm SD of age in good sleepers (global PSQI \leq 5) and poor sleepers was

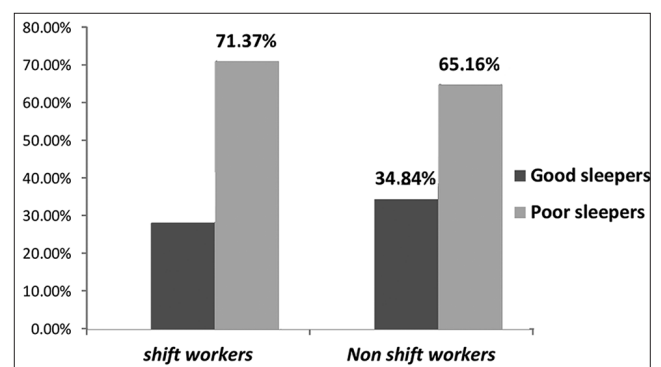


Figure 1: Prevalence of poor sleep quality among shiftworkers and non shiftworkers. The difference was not statistically significant

Table 1: Characteristics and some sleep habits of participants

Variables	Total (n=379)	Non shiftworkers (n=89)	Shiftworkers (n=290)	P value
Age (year)	33.01±8.11 ^a	38.02±9.91	31.47±6.78	0.000 *
Length of service (year)	9.74±7.91	14.51±9.37	8.28±6.79	0.000 *
Education (%)				
≤ Diploma	71.0 (269) ^b	51.6 (46)	76.9 (223)	0.000 *
> Diploma	29.0 (110)	48.4 (43)	23.1 (67)	
Marriage (%)				
Unmarried ^c	26.4 (100)	16.9 (15)	29.3 (85)	0.020 *
Married	73.6 (279)	83.1 (74)	70.7 (205)	
Number of child	1.11±0.97	1.53±1.03	0.97±0.91	0.000 *
Tea (cup/day)	4.79±3.49	4.54±3.80	4.87±3.40	0.442
Coffee (cup/day)	0.31±0.08	0.38±0.15	0.29±0.07	0.382
Exercise ^d (%)				
Professional	10.3 (39)	9 (8)	10.7 (31)	0.000 *
Daily regular	40.9 (155)	18 (16)	47.9 (139)	
Occasionally	44.6 (169)	64 (57)	38.6 (112)	
Usually no	4.2 (16)	9 (8)	2.8 (8)	
Smoking ^e (%)				
Yes	24.8 (94)	23.6 (21)	25.2 (73)	0.763
No	75.2 (285)	76.4 (68)	74.8 (217)	
Disease ^f (%)				
Yes	15.6 (59)	22.5 (20)	13.4 (39)	0.040 *
No	84.4 (320)	77.5 (69)	86.6 (251)	
Medication usage ^g (%)				
Yes	10.0 (38)	15.7 (14)	8.3 (24)	0.041 *
No	90.0 (341)	84.3 (75)	91.7 (266)	
Second job (%)				
Yes	41.2 (156)	30.3 (27)	44.5 (129)	0.018 *
No	58.8 (223)	69.7 (62)	55.5 (161)	
Time of going to bed	23.75±0.97	23.59±0.95	23.80±0.97	0.069
Sleep onset latency (minute)	23.36±16.90	17.67±14.78	25.10±17.14	0.000 *
Time of waking up	6.95±1.50	6.13±0.80	7.20±1.57	0.000 *
Sleep duration (hour)	6.26±1.34	5.90±1.08	6.37±1.40	0.001 *

[†]Because almost all professional firefighters and the most personnel of Tehran firefighting and rescue service are males, only nine females participated in our study, ^{*}Alcohol consumption is forbidden in Iran so we didn't ask them about alcohol consumption, ^{*}Statistically significant, ^aMean±SD, ^b% (n), ^cNever married, separated or divorced, ^dOn self report, ^eCurrent smoking, on self report, ^fAny kind of disease, on self report, ^gAny kind of medications, on self report

32.66 ± 8.25 and 33.20 ± 8.04 years respectively; the difference was not significant ($P = 0.54$). Also we found no significant difference between good sleepers and poor sleepers in years of job experience as a firefighter (9.16 ± 7.93 vs. 10.06 ± 7.91, $P = 0.29$) and number of monthly fire and rescue missions (64.14 ± 52.00 vs. 66.17 ± 50.72, $P = 0.74$). Tea consumption (cup/day) was higher in poor sleepers (4.10 ± 2.67 vs. 5.16 ± 3.82, $P = 0.00$).

Chi-square tests found significant deteriorated sleep quality among smokers (OR = 1.94, CI 95%: 1.14-3.28, $P = 0.01$) and among those with another job (OR = 2.43, CI 95%: 1.54-3.82, $P = 0.00$). Interestingly, having another job was significantly associated with being a shift worker (OR = 1.84, CI 95%: 1.10-3.05, $P = 0.01$).

As can be seen in Table 3, after adjusting for some relevant variables using multiple logistic

Table 2: Components of Pittsburgh Sleep quality Index (PSQI) in participants with comparisons between shiftworkers and non shiftworkers

Component	Total (n=379)	Non shift workers (n=89)	Shiftworkers (n=290)	P value
Subjective sleep quality (C1)	1.29±0.73 ^a	1.28±0.87	1.30±0.68	0.825
Sleep latency (C2)	2.13±1.67	1.49±1.66	2.33±1.63	0.000*
Sleep duration (C3)	1.03±1.01	1.24±0.94	0.97±1.03	0.027*
Habitual sleep efficiency (C4)	0.51±0.77	0.40±0.73	0.55±0.78	0.117
Sleep disturbances (C5)	1.10±0.53	1.01±0.59	1.13±0.51	0.066
Use of sleep medication (C6)	0.21±0.61	0.30±0.66	0.18±0.59	0.116
Daytime dysfunction (C7)	1.66±0.86	1.65±0.89	1.66±0.85	0.869
PSQI global score	7.97±3.77	7.39±4.10	8.14±3.65	0.099

*Statistically significant, ^aMean±SD

regression analysis, only having another job, smoking and years of job experience remained significant independent predictors of poor sleep.

DISCUSSION

The prevalence of poor sleep in our study was 69.9% (CI 95%: 65-74). There were no other contemporary studies about sleep quality of Iranian firefighters available for comparison. The prevalence of poor sleep in the present study was slightly more than 59% prevalence in the US professional firefighters^[12] but similar to “more than 70%” prevalence of poor sleep in Changhua firefighters,^[13] both were done with similar research instrument. The mean ± SD global PSQI score was 7.97 ± 3.77, 6.02 ± 3.08 and 8.5 in Tehran, the US and Changhua firefighters respectively.

The high prevalence of poor sleep quality among Tehran firefighters was the most important finding of this survey. A study on adult population of Tehran (2008) with similar method and instrument showed that 37% (CI 95%: 35-39) of them were poor sleepers.^[18] This notable sleep quality deterioration of Tehran firefighters could be attributed to multiple factors including their job.

There are many evidences that shift working can cause adverse sleep effects,^[1-3] but we did not find any significant difference between sleep quality of shift workers and non shift workers in present study.

The different findings could be due to the following four reasons: First, although shift-working firefighters work in very long shifts, the number of night missions among selected firehouses was low; therefore their night sleep may be near normal during shifts. Second, up to 75% of non shift-workers

Table 3: Multiple logistic regression analysis for sleep quality adjusted for some personal and work-related variables

Variable	Exp (B)	SE	B	Sig	95% CI for Exp (B)
Age	0.931	0.044	-0.072	0.103	0.85-1.01
Job experience	1.095	0.045	0.091	0.045*	1.00-1.19
Shiftworking	1.304	0.292	0.265	0.364	0.73-2.31
Second Job	2.081	0.249	0.733	0.003*	1.27-3.39
Smoking	2.042	0.304	0.714	0.019*	1.12-3.70
Tea consumption	1.071	0.040	0.068	0.089	0.99-1.15
Constant	4.071	1.107			

have shift-work experiences for several years in their occupational history that may cause long-term permanent deterioration of sleep quality and some studies confirm this effect.^[19,20] Third, the average years of job experience among non shift-workers are significantly greater than shift workers that can justify lower sleep quality of them as described below. Finally it seems that because of more flexibility in work schedule and having days off work following each shift among shift workers, they have more hours of night sleep and lesser work-related early morning rising in comparison with non shift workers, as seen in Table 1, that may reduce their sleep problems.^[21,22]

Although the vast majority of studies have showed older age as an important risk factor of poor sleep quality,^[19,23] our study suggested no significant age difference between good and poor sleepers. Many studies suggest that 50-55 years appear to be a critical point for sleep problems in male workers^[24-26] but only 1.1% (4) of our participants were ≥55 that can explain difference between our results and those of others. However, a recently published article

also showed a significant lower prevalence of sleep deprivation in firefighters ≥ 48 years of age.^[12]

Interestingly, we found years of job experience as an independent predictor of poor sleep after adjustment for age. Other studies have showed a linear positive relationship between job experience as a firefighter and level of traumatic stress and depression. Experienced firefighters are more likely to be encountered to human disasters.^[12,27]

In this study, smoker firefighters had a significant more poor sleep quality, as seen in Table 3, which is proved with results of similar researches in firefighters.^[12,13]

Also we found a notable higher PSQI in firefighters with second job. Another study had suggested firefighters with other job had significant greater sleepiness.^[28] Partially low monthly income may be a cause of this outcome although two days off work following each shift may be another cause in shift workers.

Some limitations of this study might be noted. First, the study design was cross-sectional with all of its limitations. Second, it was not possible to apply objective methods to this study. Third, many elder personnel, especially in central office, had no interest in the project which, similar to healthy worker effect, might be a source of underestimation.

In conclusion, a notable percent of Tehran fire and rescue service personnel were poor sleepers. Our results confirm the need for planning comprehensive programs to decrease the tendency of firefighters toward smoking and having another job. Countermeasures to ensure optimum sleep time, to raise monthly income and to manage sleep/stress of firefighters may be useful. Further follow-up studies are required to explore other probable causal factors.

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