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# Investigation Sleep Quality and Its Effective Factors in Shahroud Firefighters

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## Abstract

***Background:*** *Physical and mental health are significantly related to adequate sleep and sleep satisfaction. Sleeping disorder is one of the most severe occupational risks for modern firefighting services. Thus, the current study was conducted to evaluate sleep quality and its effective factors in firefighters.*
***Methods:*** *This descriptive-analytical study was carried out among all firefighters in Shahroud, Iran, in 2017. All data were collected by a two-part questionnaire containing demographic information and the Pittsburgh Sleep Quality Index (PSQI), which was completed while interviewing the participants. Finally, data were analyzed by SPSS software.*
***Results:*** *PSQI was obtained as 7.65±2.98, which classified into "Low Quality." Sleep latency, sleep duration, sleep disturbances and day-time dysfunction had a significant relationship with sleep quality ($P<0.05$). Moreover, the results demonstrated that PSQL score had a strong relationship with age and BMI ($F\text{-model}= 21.78$ and $P<0.001$ and $r=0.701$).*
***Conclusions:*** *Results of this study showed that firefighters have not adequate sleep quality. It is suggested to participate young people in missions since their sleep quality was better. Also, weight loss is suggested for overweight people in order to improve their sleep quality.*

**Keywords:** Sleep quality; Pittsburgh questionnaire; Firefighting.
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## Introduction

Sleep is one of the most critical circadian cycles and a complex biological pattern. Sleep-Wake cycles are one of biological circulations influenced by physiological function, light and darkness and work programs; also individual's life cycle plays an essential role in it.[1] The term "insomnia" refers to sleep disturbance, despite having enough time and proper conditions to sleep. Insomnia may include difficulty in falling asleep, difficulty in starting to sleep or not having a good sleep, or waking up at midnight and early in the morning and not being able to sleep continuously or even a combination of these abnormal conditions.[2] Insomnia can have a serious effect on work performance and disturbance in healthy social relationships.[3] Additionally, inadequate sleep can cause cognitive dysfunction and low productivity and also may cause individuals to have more medications. Similarly, workers who have insomnia are significantly more likely to have absenteeism imposing a great deal of burden on employers and community.[4]

Physical and mental health of each person is strongly related to adequate sleep and sleep satisfaction. Studies have shown that sleep deprivation reduces immune system and causes dysfunction in the hypothalamus, pituitary and adrenal glands, increases blood pressure and reduces ability of maximum level of activity in case of continuing insomnia.[1,5] Statistics show that 70% of clients of psychiatric clinics complain of sleep disorders, and this disturbance and disorder in sleep patterns can cause disturbance in activity and distress in mental states.[6] Sleep disturbances is the most common complication of shift workers, especially for rotating shifts or night work. Various studies have shown types of sleep disorders in more than 60% of shift workers.[7]

Firefighters have a high level of stress and are at risk of various physical and mental diseases.[8] Sleep disorder is one of the most serious health hazards of modern firefighting service,[9] which is important since, sleep disorders can hurt health, job performance, decision -making, and family life, and also can influence the mental health of involved individuals.[10] Firefighters protect people from fire and other emergencies in which they are exposed to various risks from physical, chemical, biological and psychological hazards.[11] Studies showed that the highest rates of disease and deaths of firefighters are directly or indirectly related to stressful nature of their job, which is among the fifth of highest occupational risks in the United States due to its high rate of mortality and morbidity.[11,12]

Many factors affect the quality of sleep According to the sleep quality in the firefighters that affect their health and those people need them, this study aims to determine the sleep quality and the affecting factors in firefighters of Shahroud-Iran.

## Materials and Methods

This descriptive-analytical study was carried on among all firefighters in Shahroud, Iran from 2017 to 2018. Demographic questionnaire and the Pittsburgh Sleep Quality Index were used. The firefighters completed the questionnaires with their consent and those with a specific disease were excluded from the study.

The Pittsburgh Sleep Quality Index has 9 questions with 7 different dimensions.[13] The first dimension is related to mental sleep quality starting with question No 9. The second

dimension is related to sleep latency while the score is characterized by two questions, namely, mean score of question 2 and score of part A of question 5. The third dimension is related to sleep duration, indicated in question 4. The fourth dimension is related to efficiency and effectiveness of sleep, determined by dividing total sleep hours by total number of hours spent by the person in bed, multiplying by 100. The fifth dimension is related to sleep disturbances and is obtained by calculating mean scores of question 5. The sixth dimension is related to the use of sleep medication, identified with Question 6. The seventh dimension is also related to day-time dysfunction, determined by calculating mean scores of questions 7 and 8.

Score of each question ranges between 0(the minimum point) and 3(the maximum point). Total average score of these 7dimensions is total score of the tool, ranging from 0 to 21. The higher the score, the lower the sleep quality. A score of 5 or less indicates good sleep quality and a score above 6 implies an undesired sleep quality.[13] Reliability and validity of this questionnaire has been confirmed in various studies and its Cronbach's coefficient alpha was between 0.78 and 0.82.[3,13,14] After data collection, data were entered into SPSS software, and statistical analysis was performed at a significance level of 0.05 using descriptive statistics, T-test, Chi-Square and Fisher Exact tests, and Multiple Linear Regressions.

## Results

Among 64 firefighters in Shahroud (Iran) 48 of them filled the Pittsburgh Sleep Quality Index and demographic information questionnaire with satisfaction and consciously. Results of the demographic information questionnaire are presented in table 1.

**Table 1. Demographic data of firefighters**

| Variables | Mean | SD |
|---|---|---|
| Age (year) | 33.35 | 6.95 |
| Height (cm) | 176.85 | 5.5 |
| Weight (kg) | 77.35 | 9.81 |
| BMI | 24.75 | 2.61 |
| Work experience (year) | 7.89 | 7.38 |
| Exercise hours per a week (hour) | 6.31 | 4.68 |

Results obtained regarding sleep quality dimensions are represented in table 2. Results showed that sleep quality of the participated firefighting personnel was equal to 7.65±2.98. The dimension of sleep duration had the most effect on this score and use of sleep medication had the least effect.

**Table 2. Total score of sleep quality and 7dimensions of the Pittsburgh Sleep Quality Index**

| Parameter | Mean | SD |
|---|---|---|
| Mental sleep quality | 0.92 | 0.85 |
| Sleep latency | 1.48 | 0.92 |
| Sleep duration | 1.69 | 1.15 |
| Sleep efficiency | 0.73 | 0.92 |
| Sleep disturbances | 1.38 | 0.61 |
| Use of sleep medication | 0.48 | 0.85 |
| Day-time dysfunction | 0.98 | 0.81 |
| Total score | 7.65 | 2.98 |

Results obtained regarding relationships between dimensions of sleep quality are shown in table 3. These results showed that sleep latency, sleep duration, sleep disturbances, and day-time dysfunction had a significant relationship with sleep quality.

**Table 3. Relationship between 7 dimensions and sleep quality**

| Sleep quality dimensions | Good (N=38) N (%) | Bad (N=10) N (%) | P.V |
|---|---|---|---|
| Mental sleep quality | | | |
| –Without problem | 11(28.9) | 6(60) | |
| –Moderate problem | 16(42.1) | 5(40) | 0.07 |
| –Serious problem | 9(23.7) | 0(0) | |
| –Very serious problem | 2.(5.3) | 0(0) | |
| Sleep latency | | | |
| –Without problem | 2(5.3) | 3(30) | |
| –Moderate problem | 21(55.3) | 3(30) | 0.01 |
| –Serious problem | 6(15.8) | 4(40) | |
| –Very serious problem | 9(23.7) | 0(0) | |
| Sleep duration | | | |
| –Without problem | 6(15.8) | 5(50) | |
| –Moderate problem | 4(10.5) | 4(40) | 0.001 |
| –Serious problem | 14(36.8) | 0(0) | |
| –Very serious problem | 14(36.8) | 1(10) | |
| Sleep efficiency | | | |
| –Without problem | 18(47.4) | 7(70) | |
| –Moderate problem | 11(28.9) | 3(30) | 0.18 |
| –Serious problem | 6(15.8) | 0(0) | |
| –Very serious problem | 3(7.9) | 0(0) | |
| Sleep disturbances | | | |
| –Without problem | 0(0) | 2(20) | |
| –Moderate problem | 21(55.3) | 6(60) | 0.05 |
| –Serious problem | 16(42.1) | 2(20) | |
| –Very serious problem | 1(2.6) | 0(0) | |
| Use of sleep medication | | | |
| –Without problem | 25(65.8) | 10(100) | |
| –Moderate problem | 4(10.5) | 0(0) | 0.06 |
| –Serious problem | 8(21.1) | 0(0) | |
| –Very serious problem | 1(2.6) | 0(0) | |
| Day-time dysfunction | | | |
| –Without problem | 7(18.4) | 8(80) | |
| –Moderate problem | 18(47.4) | 2(20) | 0.002 |
| –Serious problem | 12(31.6) | 0(0) | |
| –Very serious problem | 1(2.6) | 0(0) | |

Table 4 demonstrates comparison of variables means based on sleep quality. Differences were statistically significant in means of variables such as age, weight, BMI and, work experience between subjects with good and bad sleep quality ($P<0.05$).

**Table 4. Comparison of variables means based on sleep quality**

| Variables | Good | Bad | P.V |
|---|---|---|---|
| Age | 34.71±7.04 | 28.2±3.92 | 0.007 |
| Height | 177.03±5.43 | 176.2±6.01 | 0.68 |
| Weight | 79.69±9.56 | 69.31±5.66 | < 0.001 |
| BMI | 25.39±2.5 | 22.31±1.21 | < 0.001 |
| Work experience | 8.99±7.76 | 3.68±3.53 | 0.04 |
| Exercise hours per a week | 5.74±3.94 | 8.5±6.6 | 0.09 |

A regression analysis was performed to investigate the effect of demographic factors on quality of sleep in firefighters with backward elimination regression and the final model is presented in Equation 1. Results demonstrated that Pittsburgh sleep quality score had a strong relationship with age and BMI (F-model=21.78 and $P<0.001$ and r=0.701).

Equation No.1:

PSQI score=0.192 Age+0.482 BMI–10.65

## Discussion

The present study was conducted to investigate sleep quality and its effective factors in firefighters. 10 people out of 48 (20.8%) participated personnel was found to have bad sleep quality. Total score of the Pittsburgh Sleep Quality Index was obtained as 7.65±2.98. These results are similar to those of the study by Mehrdad et al. who studied on firefighters in Tehran province (Iran). They reported a total score of 7.97±3.77 and found that sleep quality of 69.9 % of firefighters in Tehran is bad.[15] Kim et al. also reported that sleep quality of 69.1% of firefighters in South Korea is bad.[16]

Results indicated that there is a significant relationship between sleep quality and its various dimensions in Pittsburgh Sleep Quality Index such as sleep latency, sleep duration, sleep disturbances and day-time dysfunction. Mehrdad et al. mentioned that sleep quality dimensions such as mental sleep quality, sleep latency, sleep duration, sleep disturbances and day-time dysfunction, have the most effect on total score of sleep quality and use of sleep medication has the least effect.[15] Jeong et al. reported that fast rotating shift such as 6-day shift can be recommended to improve the sleep quality of the firefighters.[17]

Results obtained from comparing demographic variables means showed that there is a significant variation between sleep quality and age, weight, BMI, and work experience; so that the lower the age, the better the sleep quality. Other studies demonstrated that sleep disorders develop by aging[18] because youth can control stress better than the aged people. Firefighters suffer from high stress due to nature of their job. They should always be ready for emergency calls and emergencies. Being prepared to respond to emergency alarm, seeing corpses for victims of accidents and death of colleagues are among strong factors in firefighting reducing sleep quality in firefighters.[19] Some studies have reported that age range of 50 - 55 years old is a critical point for sleep problems in male workers.[15]

Our results also showed that participants with lower body weight and BMI had better sleep quality than those with a higher weight and BMI. Results of various studies have represented that the increase in weight can reduce sleep quality by influencing on appetite, physical activity and body temperature.[20] Also, some studies reported that there is a significant relationship between stresses and increasing weight as both of them can influence on each other.[21] As stress can reduce sleep quality, weight gain can also contribute to lowering sleep quality. In addition, Abbasi et al. reported a significant correlation between sleep quality and body mass index (BMI).[22]

Results also showed that participants with lower work experience had better sleep quality. Consistent with previous studies, an increase in the work experience decreases sleep quality, since with the increase in the age, older people would have lower sleep quality.[23] Also, more experienced firefighters have experienced more accidents increasing their stress as an effective factor on sleep quality. Oh et al. reported that the experience of traumatic events affects sleep quality of firefighters.[24]

Results of the present study showed that sleep quality of Shahroud's firefighters is not suitable. Since young people should have more appropriate sleep quality, it is suggested to encourage them to take action. Also, weight loss is suggested for overweight people in order to improve their sleep quality.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

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