Occupational Hazards among Firefighters in Kuwait 2016

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Abstract

Background: Firefighting is extremely strenuous and physically demanding work and involves ability to cope with emergency life or death situations. The first study ever conducted on Kuwaiti firefighters was focused solely on post-traumatic stress disorder, whereas the existing study is more comprehensive covering several aspects of occupational hazards among Kuwaiti firefighters.

Aim: To explore various hazards facing Kuwaiti firefighters in order to raise their awareness level regarding the appropriate safety measures to be followed that could reduce any prospective occupational hazards.

Setting: Kuwait fire stations.

Study design: Cross-sectional study design

Methods: The study was conducted on 300 Kuwaiti firefighters aged 25-45 during June, 2016. A questionnaire was distributed to this convenient. The information collected included demographic data and information about the physical and psychological hazards that they obtained while working as firefighter. Data were entered and analyzed using SPSS program version 23.

Results: The majority, 74% of the firefighters has experienced occupational hazards such as heat stress, and 81.3% had musculoskeletal injuries throughout their years of service. While more than half of them have been emotionally traumatized.

Conclusion: The study revealed, that musculoskeletal injuries, post-traumatic stress disorder and heat stress are the most common occupational hazards among Kuwaiti firefighters. The primary causes of such incidents were probably due to the use of heavy personal protective equipment in a physically demanding job and working in closed places that super shadowed by a stressful environmental condition in particular during summer in Kuwait.

Keywords: Firefighters; Occupational hazards; Post-traumatic stress; Kuwait

Introduction

Firefighting is extremely strenuous and physically demanding work and involves an ability to cope with emergency life or death situations [1]. It is a different occupation in the sense that firefighters sacrifice their lives to protect others and their job is to extinguish fires and perform rescue operations [2]. Firefighting is also a hazardous occupation with a high incidence of workplace injury. Such hazards cover the spectrum from minor to fatal, making fire service in general as a dangerous industry. In different regions of the world, firefighters aren’t limited to extinguishing hazardous fires but are also trained to respond to medical emergencies. According to Haynes and Molis, the National Fire Protection Agency in 2015, 68,085 firefighter injuries were reported in the U.S.A. in 2015, of these, 29,130 were injuries on the fire ground [3]. Moreover, another report stated that 46% of the injuries occurred during fire ground operations. Injuries amongst firefighters during foreground operations are higher than those that occur during training, on-duty activities, and non-fire emergency incidents. The most common types of injuries that occur during fire operations were strains, sprains, and muscular pain (53%), followed by wound, cuts, and bruising (14.2%), thermal stress (7.2%) and burns (5.9%). It was found that the leading causes of these injuries among the firefighters were a strain (25.7%), falls, slips, or jumps (22.5%), and contact with an object (12.4%) [4]. Also, firefighters are exposed to a significant concentrations of hazardous chemical materials including carbon monoxide and benzene [5] that lead to fatal respiratory diseases, significant differences in liver and renal functions than the standard population [5,6]. A study reported
Materials and Methods

The total population of firefighters in Kuwait is 3908, but only 2700 firefighters of this community participate in rescue operations. A cross-sectional study was conducted over a sample size that of 300 firefighters, who were conveniently selected. Fire stations in Kuwait are distributed in all the six governorates that contain 32 fire stations. Ten of those fire stations were randomly selected representing the whole Kuwait, and 30 firefighters from each were chosen making the total 300. The inclusion criteria were any Kuwaiti male firefighter between the ages of 25 to 45 years who attended any of the selected fire stations. The study instrument was a self-administered questionnaire that was designed in the Arabic language. The questionnaire contained questions about the general occupational hazards affecting firefighters in Kuwait. A pilot study was conducted on ten firefighters selected randomly who will not be a part of this study. The study was implemented during the period from July to August 2016. Data was analyzed by SPSS version 23, and the chi-square test was used, and the p-value was considered statistically significant at <0.05.

Ethical Considerations

Ethical approval was obtained from the Research Department Committee and the Ethics and Research Committee of the Arabian Gulf University. Verbal consent from each participant in the study was taken, and they were ensured that all the obtained information is kept confidential and anonymous.

| Table 1: Personal Data. |
|-------------------------|
| **Governorate** | n | % |
| Aljahra | 60 | 20.00% |
| Alfarwanyah | 30 | 10.00% |
| Mubarak Alkaber | 30 | 10.00% |
| Alasema | 60 | 20.00% |
| Hawai | 30 | 10.00% |
| Alahmadi | 90 | 30.00% |
| Total | 300 | 100.00% |
| **Age** | | |
| 25-29 | 156 | 52.00% |
| 30-34 | 97 | 32.30% |
| ≥35 | 47 | 15.70% |
| Total | 300 | 100.00% |
| **Marital Status** | | |
| Single | 92 | 30.70% |
| Married | 208 | 69.30% |
| Total | 300 | 100.00% |
| **Educational Level** | | |
| Elementary/Middle School | 86 | 28.70% |
| High School | 163 | 54.30% |
| Undergraduate/Postgraduate | 51 | 17.00% |
| Total | 300 | 100.00% |

Three hundred were included and responded to which all were Kuwaiti nationals. Their ages were between 25 and >35 years. The majority 208(69.3%) were married, and most,
163 (54.3%) have finished high school, while only 51 (17%) held post-graduate degrees (Table 1). As for the years of service, most, 103 (34.3%) had worked as a firefighter for 1-5 years and more (223 (74.3%)) the low military rank firefighter were exposed to the risk of fire (Table 2).

With regards to occupational injuries, it was found that 38 (12.7%) experienced hearing problems, 50 (16.7%) suffered from vision problems, 14 (4.7%) and 61 (20.3%) have been diagnosed with cardiovascular and respiratory diseases consecutively. Two hundred forty-four (81.3%) of the respondents have had musculoskeletal injuries, and 138 (46%) suffered from burns. Five (1.7%) of them were diabetic, 20 (6.7%) were hypertensive, and 16 (5.3%) have high triglycerides. Seventy percent (210) are smokers (Table 3). Around three quarters (74%) of the respondents have experienced signs and symptoms of heat stress during or after the fire operation (Table 4).

### Table 2: Career-related Data.

| Job Title (Rank)? | n | %  |
|-------------------|---|----|
| Low rank          | 223 | 74.30% |
| High rank         | 77  | 25.70% |
| Total             | 300 | 100.00% |

| Years Of Service? | n | %  |
|-------------------|---|----|
| 5-Jan             | 103 | 34.30% |
| >10               | 96  | 32.00% |
| Total             | 300 | 100.00% |

| Working Hours Per Week? | n | %  |
|-------------------------|---|----|
| ≤48                     | 63  | 21.00% |
| >48                     | 237 | 79.00% |
| Total                   | 300 | 100.00% |

| Number of Fire Operations Carried Out Each Week? | n | %  |
|--------------------------------------------------|---|----|
| 5-Jan                                           | 155 | 51.70% |
| >10                                             | 44  | 14.70% |
| Total                                           | 300 | 100.00% |

### Table 3: Health-related Data.

| Measures used to address poor vision?   | n   | %  |
|-----------------------------------------|-----|----|
| Eyeglasses                              | 26  | 52.00% |
| Prescribed lenses                       | 4   | 8.00% |
| Eye surgery (laser)                     | 3   | 6.00% |
| None of the above                       | 19  | 38.00% |

### Table 4: Thermal Stress Data of the Firefighters.

| Symptoms of heat stress during your service? | n | %  |
|---------------------------------------------|---|----|
| Yes                                         | 222 | 74.00% |
| No                                          | 78  | 26.00% |
| Total                                       | 300 | 100.00% |

| Average number of experiencing any symptoms of heat stress in a month | n | %  |
|-----------------------------------------------------------------------|---|----|
| With every fire operation                                             | 26 | 11.90% |
| Once every 3 operations                                               | 23 | 10.60% |
| Once every 5 operations                                               | 26 | 11.90% |
| Once every 10 operations                                              | 32 | 14.70% |
| Irregularly                                                           | 111 | 50.90% |
| Total                                                                 | 218 | 100.00% |
With regard to psychological complications; more than half (52.7%) of the respondents have been emotionally traumatized due to their work as firefighters, 68 (43.6%) often had nightmares after being traumatized, and 104 (68%) have experienced the memory of the trauma vividly as if it was happening all over again. One hundred fifty-nine (53%) of the respondents have trouble sleeping, and 179 (59.9%) didn’t find their sleeping hours sufficient according to the nature of their work (Table 5).

Table 5: Post Traumatic Stress Disorder and Sleep Disorder.

|                                      | N    | %   |
|--------------------------------------|------|-----|
| Emotionally traumatized              |      |     |
| Yes                                  | 158  | 52.70% |
| No                                   | 142  | 47.30% |
| Total                                | 300  | 100.00% |
| Occurrence of nightmares             |      |     |
| Always                               | 22   | 14.10% |
| Often                                | 68   | 43.60% |
| Sometimes                            | 25   | 16.00% |
| Rarely                               | 12   | 7.70%  |
| Never                                | 29   | 18.60% |
| Total                                | 156  | 100.00% |

Table 6 shows a strong relationship between socio-demographical data and symptoms of heat stress (P<0.034) and it was more among the older group. Also, it was found that there is a significant relationship between heat stress and educational level, (P<0.001). And there is a significance relationship between heat stress and job ranks, (P<0.016). It increases as the rank increases. There is also a significant correlation between heat stress and years of service because (P<0.001). The percentage of heat stress increases as the years of service increases. There was no relationship between other socio-demographical data (marital status, hours of work and fire operation per week) and heat stress (Table 6).

Table 6: Relationship between Socio-Demographical Data and Symptoms of Heat Stress.

|                                      | Did you ever experience any symptoms of heat stress during your service? | Chi-Square | P-value |
|--------------------------------------|------------------------------------------------------------------------|------------|---------|
|                                      | Yes | %         | No | %         |                  |
| N                                    |     |           |    |            |                  |
| Age in years                          |     |           |    |            | 0.034             |
| 25-29                                 | 106 | 67.90%    | 50 | 32.10%    |                   |
| 30-34                                 | 80  | 82.50%    | 17 | 17.50%    |                   |
| ≥35                                   | 36  | 76.60%    | 11 | 23.40%    |                   |
| Marital status                        |     |           |    |            | 0.16               |
| Single                                | 73  | 79.30%    | 19 | 20.70%    |                   |
| Married                               | 149 | 71.60%    | 59 | 28.40%    |                   |
| Educational level                     |     |           |    |            | 0.001              |
| Elementary / High School              | 51  | 59.30%    | 35 | 40.70%    |                   |
| Undergraduate / Postgraduate          | 131 | 80.40%    | 32 | 19.60%    |                   |
|                                      | 40  | 78.40%    | 11 | 21.60%    |                   |
| What is your job title (rank)?        |     |           |    |            | 0.016              |
| Low rank                              | 157 | 70.40%    | 66 | 29.60%    |                   |
| High rank                             | 65  | 84.40%    | 12 | 15.60%    |                   |
| How many years of service?            |     |           |    |            | <0.001             |
| 5-Jan                                 | 63  | 61.20%    | 40 | 38.80%    |                   |
| 10-Jun                                | 77  | 76.20%    | 24 | 23.80%    |                   |
| >10                                   | 82  | 85.40%    | 14 | 14.60%    |                   |
| On average, how many hours do you work per week? |     |           |    |            | 0.902              |
| ≤48                                   | 47  | 74.60%    | 16 | 25.40%    |                   |
| >48                                   | 175 | 73.80%    | 62 | 26.20%    |                   |
| On average, how many fire operations are carried out each week? |     |           |    |            | 0.407              |
| 5-Jan                                 | 119 | 76.80%    | 36 | 23.20%    |                   |
| 10-Jun                                | 70  | 69.30%    | 31 | 30.70%    |                   |
| >10                                   | 33  | 75.00%    | 11 | 25.00%    |                   |
Table 7: Relationship between Socio-Demographical Data and Musculoskeletal Injuries of Kuwaiti Firefighters in 2016.

|                       | Musculoskeletal Injuries | Chi-Square P-value |
|-----------------------|--------------------------|---------------------|
|                       | Yes | No                   | N       | %     | n       | %     |                      |
| **Age in years**      |     |                      |         |       |         |       |                      |
| 25 - 29               | 118 | 75.60%               | 38      | 24.40%| 0.022   |       |                      |
| 30 - 34               | 83  | 85.60%               | 14      | 14.40%| 0.850   |       |                      |
| ≥35                   | 43  | 91.50%               | 4       | 8.50% | 0.081   |       |                      |
| **What is your job title (rank)?** |     |                      |         |       |         |       |                      |
| Low rank              | 175 | 78.50%               | 48      | 21.50%| 0.031   |       |                      |
| High rank             | 69  | 89.60%               | 8       | 10.40%| 0.001   |       |                      |
| **Educational level** |     |                      |         |       |         |       |                      |
| Elementary / Middle School | 57| 66.30%               | 29      | 33.70%| <0.001  |       |                      |
| High School           | 141 | 86.50%               | 22      | 13.50%| 0.503   |       |                      |
| Undergraduate / Postgraduate | 46| 90.20%               | 5       | 9.80% | <0.010  |       |                      |
| **How many years of service?** |     |                      |         |       |         |       |                      |
| 5-Jan                 | 70  | 68.00%               | 33      | 32.00%| <0.001  |       |                      |
| 10-Jun                | 88  | 87.10%               | 13      | 12.90%| 0.001   |       |                      |
| >10                   | 86  | 89.60%               | 10      | 10.40%| 0.001   |       |                      |
| Burn Injuries         |     |                      |         |       |         |       |                      |
| **Educational level** |     |                      |         |       |         |       |                      |
| Elementary / Middle School | 31| 36.00%               | 55      | 64.00%| 0.032   |       |                      |
| High School           | 77  | 47.20%               | 86      | 52.80%| 0.082   |       |                      |
| Undergraduate / Postgraduate | 30| 58.80%               | 21      | 41.20%| 0.001   |       |                      |
| **Age in years**      |     |                      |         |       |         |       |                      |
| 25 - 29               | 61  | 39.10%               | 95      | 60.90%| 0.041   |       |                      |
| 30 - 34               | 53  | 54.60%               | 44      | 45.40%| 0.004   |       |                      |
| ≥35                   | 24  | 51.10%               | 23      | 48.90%| 0.004   |       |                      |
| 5-Jan                 | 34  | 33.00%               | 69      | 67.00%| 0.001   |       |                      |
| **How many years of service?** |     |                      |         |       |         |       |                      |
| 10-Jun                | 51  | 50.50%               | 50      | 49.50%| 0.004   |       |                      |
| >10                   | 53  | 55.20%               | 43      | 44.80%| 0.004   |       |                      |

Table 7 highlights the relationships between various factors and the occupational hazardous. As shown there is a significant relationship between age and musculoskeletal injuries, P<0.022 the musculoskeletal injuries increases with age. There is also a significant relationship between musculoskeletal injuries and educational level, P<0.001 the higher qualified are more prone to injuries. There is a significant correlation between musculoskeletal injuries and job ranks because of the P<0.031. It increases as the rank increases. There is also a significant correlation between musculoskeletal injuries and years of service because P<0.001. The percentage of musculoskeletal injuries increases as the years of service increases. With regards to burning injuries similar findings were found as there is a significant relationship between the occurrence of burn injuries, and age (P<0.041), educational level (P<0.032) and years of service (P<0.004).

Discussion

To our knowledge, this is the first study conducted in Kuwait that covers several aspects of occupational hazards among firefighters. Our data showed that the most susceptible age group to heat stress, post-traumatic stress disorder (PTSD), musculoskeletal injuries and burns are the younger group (25 to 29 years). Three-quarters of the firefighters have experienced heat stress hazards during their career that presented by nausea, dizziness, and visual disturbances and reddening skin. This could be explained by the fact that most of the fires occur in closed places, which make the firefighters at great risk of developing heat stress since their core temperature, skin temperature, and thermal sensation will be elevated [9].

The study found as well that more than fifty percent of the studied group has had emotional traumas reflected by...
nightmares which are the primary symptom of PTSD that is higher than a reported study in the USA and Germany where only 18.2% suffered from PTSD [13]. According to a survey carried out in Iran, sleep quality deterioration is notably common among firefighters [14].

A USA study in 2007, reported that musculoskeletal injuries such as sprains account for 40% of injuries among firefighters [5] in contrast to our study which showed that it is 81.3%. This could be explained by the fact the maybe the Kuwaiti firefighter need to be more physically fit to avoid such problems. Other reason might be that they are not provided with health insurance and regular health check-ups which make them being neglected. Our study showed a high percentage of burns (46%) among the firefighters when compared to a report from USA (28%) [6].

Due to the exposure of firefighters to hazardous chemicals during their missions, a study in the United States in 1990 illustrated that there is an increased risk of dying from non-malignant respiratory diseases [8]. Our studies showed that 20.3% of firefighters were diagnosed with a respiratory illness after working as firemen.

Conclusion

The study revealed that musculoskeletal injuries, post-traumatic stress disorder, and heat stress are the most common occupational hazards among Kuwaiti firefighters and its prevalence is much higher than reported figures. The primary causes for such incidents are the use of heavy personal protective equipment in a physically demanding job and working in closed places.

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