



Occupational Hazards among Firefighters in Kuwait 2016



Alahmad Shaikha¹, Ahmad Farah¹, Alhammad Israa¹, Almasoud Waleed¹, Almonayea Lulwa¹, Albahrani Abdulaziz¹, Sarkhouh Mariam¹, Alshaheen Noura¹, Alfoudari Abdulaziz¹, Boolayan Sundus¹, Alnasir Faisal^{2*} and Alsayyad Adel³

¹Department of Family & Community Medicine, Arabian Gulf University, Bahrain

²Professor of family Medicine and Former Department Chairman, Bahrain

³Associate Professor of Family Medicine, Bahrain

Submission: February 21, 2017; **Published:** March 24, 2017

***Corresponding author:** Alnasir Faisal, Professor of family Medicine and Former Department Chairman, Department of Family & Community Medicine, College of Medicine & Medical Sciences, Arabian Gulf University, Bahrain, Email: faisal.alnasir@gmail.com

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

that the personal protective equipment that the firefighters carry could increase their blood pressure causing cardiovascular diseases [7]. The fitness level of the firefighter could ameliorate their chances of developing musculoskeletal problems [8]. Hearing loss due to noise is one of serious complications that the firefighters are likely to suffer from over time due to high levels of noise exposure. A study in the United States reported that out of 425 firefighters, 40% showed hearing loss, and the left ear showed significantly poorer hearing than the right ear [9]. Moreover, they are more prone to psychological problems such post-traumatic stress disorder (PTSD). A study reported the prevalence of 18% and other psychiatric impairments [10]. In comparison with the average population, sleep quality deterioration is more common among firefighters as well [11]. The increased in environmental temperatures could lead to increased thermal stress and exertion with a decreased work output. Studies showed that the job performance of firefighters was reduced by 19% when they are present in a 45 °C chamber compared to an 18 °C room [1]. Firefighters also face cardio-respiratory problem [9]. Low cardio-respiratory fitness and the metabolic syndrome are also associated with increased risk of cardiovascular disease-related events. Out of 214 male firefighters in Colorado, 32 firefighters were diagnosed with metabolic syndrome and 54 failed to achieve a generally accepted minimum cardio-respiratory fitness level [12]. In a study conducted in Tehran, Iran, out of 147 firefighters, 7% had pulmonary dysfunction, and 25% had hearing loss. Some of them had modifiable coronary heart disease risk factors. Thirteen of the firefighters were unfit for the job. Ten of the 13 firefighters were unfit due to vision capability, one case due to hypertension, and two cases due to pulmonary dysfunction [13]. Due to high risk of hearing loss, firefighters need to undergo an injury prevention programmer to reduce it [14]. As a result of sleep disturbances and poor sleep quality, firefighters may develop musculoskeletal problems and depression [15].

Even though firefighters are exposed to many occupational hazards, studies regarding these risks in Kuwait are either insufficient or outdated. Therefore, the primary aim of our study is to explore various hazards that the Kuwaiti firefighters might face during their work to raise their awareness level. Such awareness will help to reduce any prospective occupational hazards by taking appropriate safety measures. Ultimately, the public attention and awareness will be withdrawn to the dangers that the firefighters at risk of throughout their career.

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-administrated 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.

Results

Table 1: Personal Data.

		n	%
Governorate	Aljahra	60	20.00%
	Alfarwanyah	30	10.00%
	Mubarak Alkaber	30	10.00%
	Alasema	60	20.00%
	Hawali	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).

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?	5-Jan	103	34.30%
	10-Jun	101	33.70%
	>10	96	32.00%
	Total	300	100.00%
Working Hours Per Week?	≤48	63	21.00%
	>48	237	79.00%
Number of Fire Operations Carried Out Each Week?	Total	300	100.00%
	5-Jan	155	51.70%
	10-Jun	101	33.70%
	>10	44	14.70%
	Total	300	100.00%

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 3: Health-related Data.

		Yes		No	
		n	%	n	%
Any hearing problem due to firefighting?		38	12.70%	262	87.30%
Do they ask people to repeat their words to hear them clearly?		32	84.20%	6	15.80%
Hearing sounds ringing or humming chronically?		29	76.30%	9	23.70%
Any vision problem due to firefighting?		50	16.70%	250	83.30%
Exact vision problem	Foresight	17	34.00%	33	66.00%
	Nearsighted	14	28.00%	36	72.00%
	Astigmatism	14	28.00%	36	72.00%
	Other	7	14.00%	43	86.00%

Measures used to address poor vision?	Eyeglasses	26	52.00%	24	48.00%
	Prescribed lenses	4	8.00%	46	92.00%
	Eye surgery (laser)	3	6.00%	47	94.00%
	None of the above	19	38.00%	31	62.00%
Cardiovascular / respiratory system	Were you diagnosed with heart-related diseases after working as a fireman?	14	4.70%	286	95.30%
	Did you receive treatment for this disease?	6	42.90%	8	57.10%
	Were you diagnosed with respiratory disease after working as a fireman?	61	20.30%	239	79.70%
	Did you receive treatment for this disease?	41	67.20%	20	32.80%
Metabolic syndrome data	Diabetes	5	1.70%	295	98.30%
	High blood pressure	20	6.70%	280	93.30%
	High triglycerides	16	5.30%	284	94.70%
Injuries	Musculoskeletal injuries	244	81.30%	56	18.70%
	Burns	138	46.00%	162	54.00%
Smoking habit		210	70.00%	90	30.00%

Table 4: Thermal Stress Data of the Firefighters.

		N	%
Symptoms of heat stress during your service?	Yes	222	74.00%
	No	78	26.00%
	Total	300	100.00%
Average number of experiencing any symptoms of heat stress in a month	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%

Experience of memory vividly as if it were happening all over again	Yes	104	68.00%
	No	49	32.00%
	Total	153	100.00%
Sleeping trouble	Yes	159	53.00%
	No	141	47.00%
	Total	300	100.00%
Is sleeping hours sufficient	Yes	120	40.10%
	No	179	59.90%
	Total	299	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	%	n	%	
Age in years	25-29	106	67.90%	50	32.10%	0.034
	30-34	80	82.50%	17	17.50%	
	≥35	36	76.60%	11	23.40%	
Marital status	Single	73	79.30%	19	20.70%	0.16
	Married	149	71.60%	59	28.40%	
Educational level	Elementary /	51	59.30%	35	40.70%	0.001
	High School	131	80.40%	32	19.60%	
	Undergraduate / Postgraduate	40	78.40%	11	21.60%	
What is your job title (rank)?	Low rank	157	70.40%	66	29.60%	0.016
	High rank	65	84.40%	12	15.60%	
How many years of service?	5-Jan	63	61.20%	40	38.80%	<0.001
	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?	≤48	47	74.60%	16	25.40%	0.902
	>48	175	73.80%	62	26.20%	
On average, how many fire operations are carried out each week?	5-Jan	119	76.80%	36	23.20%	0.407
	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%	
	≥35	43	91.50%	4	8.50%	
What is your job title (rank)?	Low rank	175	78.50%	48	21.50%	0.031
	High rank	69	89.60%	8	10.40%	
Educational level	Elementary / Middle School	57	66.30%	29	33.70%	<0.001
	High School	141	86.50%	22	13.50%	
	Undergraduate / Postgraduate	46	90.20%	5	9.80%	
How many years of service?	5-Jan	70	68.00%	33	32.00%	<0.001
	10-Jun	88	87.10%	13	12.90%	
	>10	86	89.60%	10	10.40%	
			Burn	Injuries		
Educational level	Elementary / Middle School	31	36.00%	55	64.00%	0.032
	High School	77	47.20%	86	52.80%	
	Undergraduate / Postgraduate	30	58.80%	21	41.20%	
Age in years	25 - 29	61	39.10%	95	60.90%	0.041
	30 - 34	53	54.60%	44	45.40%	
	≥35	24	51.10%	23	48.90%	
	5-Jan	34	33.00%	69	67.00%	
How many years of service?	10-Jun	51	50.50%	50	49.50%	0.004
	>10	53	55.20%	43	44.80%	

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.

Acknowledgement

Special thanks to all of the participants who supported and helped to make this research possible, especially Major/ Ahmed Abdullah Kamshad.

References

1. Larsen B, Snow R, Williams-Bell M, Aisbett B (2015) Stimulated Firefighting Task Performance and Physiology under Very Hot Conditions. *Frontiers in Physiology* 6: 322.
2. Kim MG, Kim KS, Ryoo JH, Yoo SW (2013) Relationship between Occupational Stress and Work-related Musculoskeletal Disorders in Korean Male Firefighters. *Annals of Occupational and Environmental Medicine* 25(1): 9.
3. Hylton JG, Haynes, Joseph L, Molis (2016) Firefighter injuries in the United States. NFPA's. Report U.S. Firefighter Injuries-2015, USA.
4. Hong O, Chin DL, Phelps S, Feld J, Vogel S (2012) Occupational injuries, duty status and factors associated with injuries among firefighters. *Workplace Health & Safety* 60(12): 517-523.
5. Al-Malki AL, Rezq AM, Al-Saedy MH. Al-Saedy (2008) Effect of fire smoke on some biochemical parameters in firefighters of Saudi Arabia. *Journal of Occupational Medicine and Toxicology* 3: 33.
6. Rosénstock L, Demers P, Heyer NJ, Barnhart S (1990) Respiratory mortality among firefighters. *British Journal of Industrial Medicine* 47(7): 462-465.
7. Fearheller DL (2015) Blood pressure and heart rate responses in volunteer firefighters while wearing personal protective equipment. *Blood Pressure Monitoring* 20(4): 194-198.
8. Poplin GS, Roe DJ, Peate W, Harris RB, Burgess JL (2014) The Association of Aerobic Fitness with Injuries in the Fire Service. *Am J Epidemiol* 179(2): 149-155.
9. Hong O, Chin DL, Samo DG (2013) Hearing loss and use of hearing protection among career firefighters in the United States. *J Occup Environ Med* 55(8): 960-965.
10. Wagner D, Heinrichs M, Ehlerth UU (1998) Prevalence of symptoms of posttraumatic stress disorder in German professional firefighters. *Am J Psychiatry* 155(12): 1727-32.
11. Mehrdad R, Haghighi KS, Esfahani AH (2013) Sleep Quality of Professional Firefighters. *Int J Prev Med* 4(9): 1095-1100.
12. Donovan R, Nelson T, Peel J, Lipsey T, Voyles W et al. (2009) Cardiorespiratory fitness and the metabolic syndrome in firefighters. *Occupational Medicine* 59(7): 487-492.
13. Mehrdad R, Movasatian F, Momenzadeh AS (2013) Fitness for Work Evaluation of Firefighters in Tehran. *Acta Medica Iranica* 51(4): 265-269.
14. Neitzel RL, Long RN, Sun K, Sayler S, von Thaden TL (2015) Injury Risk and Noise Exposure in Firefighter Training Operations. *Ann Occup Hyg* 60(4): 405-420.
15. Lim DK, Baek KO, Chung IS, Lee MY (2014) Factors Related to Sleep Disorders among Male Firefighters. *Ann Occup Environ Med* 26: 11.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/CTCMI.2017.01.555558](https://doi.org/10.19080/CTCMI.2017.01.555558)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats (Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>