

## Original Article

## Knowledge Levels of The Risk Factors for Cardiovascular Disease in Firefighters, the Prevalence of Obesity and the Affecting Risk Factors

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The study was conducted at the Metropolitan Municipality Fire Department in Manisa, Turkey, from 1-31 January 2016.

### Abstract

**Background:** Obesity and cardiovascular diseases are among the major problems for firefighters.

**Aim:** The aim of the study was to determine the level of knowledge of the risk factors of cardiovascular disease among firefighters, the prevalence of obesity, and the affecting factors.

**Methodology:** This cross-sectional study was conducted with 147 firefighters in Turkey, in 2016. Data were collected with the descriptive characteristics form, the Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) Scale. Firefighters' weight, height, and waist circumference were measured.

**Results:** The mean age of the all-male participants was  $34.88 \pm 7.78$  years. 42.9% were educated to the high school level. The prevalence of obesity was 22.5%. The obesity level of the firefighters according to their body mass index was affected by their age, mean duration of working, and whether they regularly ate a midday meal; according to their waist measurement, age, marital status, mean duration of working and body type perception affected abdominal obesity ( $p < 0.05$ ). The firefighters' mean score on the CARRF-KL Scale was  $16.72 \pm 4.74$ .

**Conclusions:** There was a high prevalence of overweight and obesity among firefighters. At the same time, it was observed that the level of knowledge of many of them concerning the risk factors of smoking, not taking regular physical exercise and cardiovascular diseases was at a medium level. For this reason, it is recommended that firefighters should be informed about cardiovascular risk factors, and education should be conducted on nutrition, exercise, and smoking. The results of this study indicate that occupational health workers (for examples doctor, occupational health nursing) should provide firefighters with services to reduce the risk of cardiovascular diseases.

**Keywords:** Cardiovascular diseases, risk factors, knowledge levels, obesity, firefighters.

### Introduction

Firefighters constitute a high-risk group for cardiovascular diseases, and obesity is a significant health problem among firefighters (Lessons & Bhakta, 2018; Smith et al., 2018; Savall et al., 2021). Long periods of inactivity, inadequate physical activity, poor nutritional habits and shift work are a cause of obesity in

firefighters. In addition, these factors have been identified as chronic stressors which increase the risk of cardiac artery disease (Smith et al., 2012; Sotos-Prieto et al., 2017; Damacena et al., 2020). Because of the nature of their work, firefighters are involved in excessively tiring activities in emergency situations, but they spend a long time inactive at the station (Smith et al., 2012), and this

causes them to consume predominantly food with oil and carbohydrates (Soteriades et al., 2005). Firefighters tend to gain approximately 0.5-1.5 kg a year throughout their careers (Soteriades et al., 2005). Examining studies in the world in general, it is seen that the incidence of obesity in firefighters stands at 11-59% (Smith et al., 2012; Martin et al., 2019; Damacena et al., 2020;).

Obesity carries a high risk of injury, disability, cardiovascular diseases, and sudden cardiac death (Kaipust et al., 2019; Mathias et al., 2020). Cardiovascular diseases are the most significant cause of death at work among firefighters (Yoo & Franke, 2009; Smith et al., 2012). It has been found that even a small weight loss has a positive effect on the risk factors for cardiovascular disease (Brown et al., 2016). In Turkey as a whole, it is seen that cardiovascular diseases are in first place among all causes of death (Turkish Ministry of Health, 2015). However, studies published in Turkey on the prevalence of cardiovascular disease and obesity in firefighters are limited (Kamuk, 2020). It is necessary first to identify the cardiovascular risk factors of coronary heart disease and other cardiovascular diseases and then to take them under control, whether in terms of frequency of occurrence or in order to reduce death rates. The purpose of this study was to determine the level of knowledge of risk factors of cardiovascular disease among firefighters, the prevalence of obesity, and the factors affecting it. The research questions in this study were:

1. What is the prevalence of obesity among firefighters?
2. What are the factors affecting the obesity status of firefighters?
3. What is the Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) of firefighters?

## Methods

The cross-sectional study was conducted between 1 and 31 January 2016 at fire stations of the Metropolitan Municipality Fire Department in Manisa which is in the west of Turkey. The population of the study consisted of the 220 firefighters in the 20-60 year age group. Selection of a sample (n:147) was carried out by making use of the formula  $n = (N \cdot t^2 pq) / (d^2 (N-1) + t^2 pq)$  where the number of individuals in the population is known (Esin, 2014).

The following forms were used in the collection of data;

**Descriptive characteristics form:** This form was prepared by the researchers according to the literature (Soteriades et al., 2005; Yoo & Franke, 2009; Smith et al., 2012). It included sections on sociodemographic data, health status, and healthy lifestyle behaviors (18 questions). The questions were on age, marital status, educational levels, smoking, income level, duration of work, daily sleep duration, the presence of chronic illness, family history of coronary artery disease, physical activity, eating three meals a day, eating fast-food type foods, daily consumption of bread, use of salt on food, perception of body type, and knowledge of cholesterol level.

## The Cardiovascular Disease Risk Factors

**Knowledge Level:** The CARRF-KL scale was used to determine the knowledge level concerning risk factors for cardiovascular diseases. The scale validity and reliability tests were conducted by Arikan et al. (2009). All 28 items were based on true/false statements, requiring a response in the form of "Yes", "No" or "Don't know". Each correct answer was awarded one point; 22 questions were scored directly, and six items were false and were therefore inversely scored. The highest possible score on the scale was 28. A high score indicated a high knowledge level. The Cronbach's alpha was 0.77 and in the present study, it was found to be 0.80.

**Anthropometric measurements:** Measurements of participants' height, weight, and waist circumference (WC) were made by the second researcher at the time of the morning shift change. A single weighing scale and one non-flexible measuring stick were used for the measurements. Body weight was measured before a meal, in light clothing, and without shoes on a weighing scale of 0.5 kg sensitivity. Height was measured without shoes, with the feet together, and with the head in the Frankfort plane (the eye triangle and the top of the ears at the same level). The WC measurement was made at the end of a normal expiration with the person standing, the abdomen relaxed, and the arms by the sides, in a face-to-face position and holding the measure horizontally. Measurement was made passing through the midpoint between the lowest rib and the iliac crest. Hip circumference was measured by standing beside the individual and measuring the circumference from the highest point; it was recorded in centimeters (cm).

The waist circumference limit was evaluated 102 cm for males. An evaluation of the body mass index (BMI, kg/m<sup>2</sup>), limit values were taken as follows: <18.5 underweight, 18.5-24.9 normal, 25.0-29.9 overweight, 30.0-39.9 obese, >40.0 severe obesity (Smith et al., 2012; Centers for Disease Control and Prevention, 2020).

**Ethics:** The necessary institutional permission was obtained to conduct the study from the ethics committee of Ege University Nursing Faculty (No:2016/252), an institution permit from Manisa Metropolitan Municipality Fire Department, and the scale use permit. Verbal approval was obtained from the firefighters who took part voluntarily in the study.

**Statistical Analysis:** The Statistical Package for Social Sciences for Windows 22.0 was used and the distribution of the data was calculated using numerical, percentage, mean values, and standard deviations. The Kolmogorov-Smirnov test was used to evaluate data for conformity to normal distribution. Chi-square tests, Fisher's exact tests, Mann-Whitney U, and Student's t-test were used in evaluating the differences between obesity prevalence and affecting factors. Results were evaluated with a confidence interval of 95% and the level of statistical significance was taken as  $p < 0.05$  (Esin, 2014).

## Results

**Socio-demographic data** The mean age of firefighters was  $34.88 \pm 7.78$  years (min:21, max:58), all were male, 42.9% were educated to high-school level, and 82.3% were at a medium economic level. All of the firefighters worked on shifts over 24 hours, and the mean duration of their work in firefighting was  $6.72 \pm 6.25$  years (min:1, max:25).

## Health status

No chronic illness was found in 93.9% of the participants, but 6.1% had diseases such as hypertension, herniated disc, allergic asthma, hepatitis B, Behcet's disease, or sleep apnea. None of the participants had a history of cardiovascular disease. The mothers and fathers of 15.6% of the participants had a history of coronary heart disease. The heart attack rate was 4.1% in their mothers and 6.1% in their fathers; and sudden death had occurred in 2.7% of mothers and 4.8% of fathers. Also, 50.3% of the participants stated that their cholesterol levels were normal, while

49.7% stated that they did not know their cholesterol levels.

## Healthy lifestyle behaviors

It was determined that the participants slept for an average of  $7.32 \pm 1.24$  hours a day (min:4, max:10); 69.4% of the participants smoked, and those who smoked had been doing so for an average of  $12.53 \pm 7.22$  years (min:1, max:30), and they stated that they smoked on average  $18.42 \pm 6.63$  cigarettes a day (min:2, max:40). It was stated by 59.2% of the participants that they took regular physical exercise. The proportion of firefighters who used salt on their food was 83.0%; 82.3% had a regular breakfast, 63.9% had a regular midday meal, and 86.4% had a regular evening meal, and 48.3% ate fast-food type foods. Mean daily bread consumption was found to be  $1.39 \pm 0.57$  (min:0.5, max:3). When the obesity levels of the firefighters were assessed according to BMI (kg/m<sup>2</sup>), it was found that 1.4% were underweight, 23.8% were of normal weight, 52.4% were overweight, 21.1% were at the obesity I level, and 1.4% were at the obesity II level. According to WC (cm), 65.3% were at low risk ( $\leq 102$ ), and 34.7% were at high risk ( $> 102$ ). Only 15% of the firefighters perceived themselves as overweight.

## Obesity prevalence and affecting factors

Table 1 shows the relationship between the firefighters' obesity levels and the affecting factors. It was found that obesity levels according to BMI among the firefighters were affected by age, mean duration of work, perception of body type and eating regular midday meals ( $p < 0.05$ ). It was found that abdominal obesity according to WC measurement was affected by age, marital status, mean duration of work, and perception of body type ( $p < 0.05$ ).

## Knowledge levels of the risks of cardiovascular disease

Table 2 shows the responses given by the firefighters to the statements on the scale. According to this, the highest number of correct answers was given to the statement "It is beneficial to eat 2-3 portions of fruit and 2 portions of vegetable daily", and the lowest to "There is a risk of heart disease if good (HDL) cholesterol is high". The firefighters had a mean score  $16.72 \pm 4.74$  (min: 0, max: 26) of on the CARRF-KL scale.

**Table 1. The relationship between firefighters' obesity levels and affecting factors**

	Characteristics	Obesity prevalence					
		BMI<30	BMI≥30	p	WC≤102	WC>102	p
<b>Socio-demographic</b>	<b>Age</b>						
	<35 years	69	10	<b>0.002*</b>	60	19	<b>0.003*</b>
	≥35 years	45	23		36	32	
	<b>Marital status</b>						
	Married	83	27	0.294*	66	44	<b>0.020*</b>
	Single	31	6		30	7	
	<b>Education level</b>						
Below high school	34	14	0.174*	30	18	0.619*	
Above high school	80	19		66	33		
<b>Income level</b>							
Low/Medium	101	30	1.00**	87	44	0.420*	
Good	13	3		9	7		
<b>Mean duration of work (x±SD)</b>	6.01±5.95	9.18±6.73	<b>0.008 ***</b>	5.90±5.85	8.27±6.74	<b>0.024 ***</b>	
<b>Health status</b>	<b>Perception of body type</b>						
	Underweight/Normal	102	23	<b>0.005*</b>	87	38	<b>0.009*</b>
	Overweight	12	10		9	13	
	<b>Cholesterol level</b>						
	Normal	55	19	0.345*	46	28	0.420*
	Don'tknow	59	14		50	23	
<b>Family history of coronary heart disease</b>							
Yes	17	6	0.649*	15	8	0.992*	
No	97	27		81	43		
<b>Chronic illness</b>							
Yes	6	3	0.420**	7	2	0.497**	
No	108	30		89	49		
<b>Healthy Lifestyle Behaviors</b>	<b>Mean daily hours of sleep</b>	7.39±1.18	7.06±1.43	0.180****	7.39±1.17	7.18±1.37	0.322****
	<b>Mean daily bread consumption</b>	1.37±0.58	1.45±0.56	0.474****	1.36±0.59	1.44±0.54	0.444****

<b>Daily exercise</b>	Yes	68	19	0.831*	56	31	0.774*
	No	46	14		40	20	
<b>Use of salt on food</b>	Yes	97	25	0.209*	83	39	0.125*
	No	17	8		13	12	
<b>Regular breakfast</b>	Yes	95	26	0.547*	78	43	0.643*
	No	19	7		18	8	
<b>Regular midday meal</b>	Yes	78	16	<b>0.036*</b>	63	31	0.561*
	No	36	17		33	20	
<b>Regular evening meal</b>	Yes	100	27	0.384*	82	45	0.635*
	No	14	6		14	6	
<b>Consumption of fastfoods</b>	Yes	58	13	0.245*	49	22	0.361*
	No	56	20		47	29	
<b>Smoking</b>	Yes	77	25	0.367*	68	34	0.602*
	No	37	8		28	17	

BMI, body mass index, WC, waist circumference Statistically significant at  $p < 0.05$

\* Chi square \*\*Fisher's exact test \*\*\*Mann-Whitney U test \*\*\*\*Student's t-test

**Table 2:** Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) Scale Scores

		Correct		Incorrect	
		n	(%)	n	%
1. A person always realizes if he/she has a heart disease.	T	34	23.1	113	76.9
2. A family history of cardiovascular disease CVD increases your risk of having heart disease.	T	100	68.0	47	32.0
3. Elderly people are at a higher risk for heart diseases.	T	93	63.3	54	36.7
4. Coronary heart diseases can be prevented.	T	66	44.9	81	55.1
5. Smoking is a preventable cause of death and diseases in our country.	T	116	78.9	31	21.1
6. Smoking is a risk factor for heart disease.	T	132	89.8	15	10.2
7. The risk of developing heart disease is reduced when smoking is stopped.	T	114	77.6	33	22.4
8. It is beneficial to eat 2-3 portions of fruit and 2 portions of vegetable daily.	T	137	93.2	10	6.8

9. It is harmful to eat red meat more than 3 times a week.	T	77	52.4	70	47.6
10. Eating salty lead to increases in blood pressure.	T	127	86.4	20	13.6
11. Fatty meals do not increase the cholesterol level in blood.	F	82	55.8	65	44.2
12. Fats that are solid at room temperature are beneficial for heart health.	F	68	46.3	79	53.7
13. A low carbohydrate and low-fat diet is beneficial for heart health.	T	90	61.2	57	38.8
14. Overweight individuals have higher risk of heart disease.	T	132	89.8	15	10.2
15. Regular exercise reduces the risk of heart disease.	T	128	87.1	19	12.9
16. Risk can be reduced by exercising only in a gym.	F	89	60.5	58	39.5
17. Slow walking and wandering are also considered as exercise	F	31	21.1	116	78.9
18. Stress, sorrow, and burden increase the risk of heart disease.	T	132	89.8	15	10.2
19. Blood pressure increases under stressful conditions.	T	121	82.3	26	17.7
20. High blood pressure is a risk factor for heart disease.	T	113	76.9	34	23.1
21. Blood pressure control reduces the risk of heart disease.	T	85	57.8	62	42.2
22. Hypertension medications should be used for a lifetime.	T	73	49.7	74	50.3
23. High cholesterol is a risk factor for heart disease.	T	92	62.6	55	37.4
24. There is a risk of heart disease if good (HDL) cholesterol is high.	F	20	13.6	127	86.4
25. There is a risk of heart disease risk if bad (LDL) cholesterol is high.	T	51	34.7	96	65.3
26. Every person with high cholesterol level is given medicine.	F	32	21.8	115	78.2
27. Diabetes is a risk factor for heart disease.	T	52	35.4	95	64.6
28. The risk can be reduced in diabetic patients with glucose control.	T	71	48.3	76	51.7

T(True), F (False)

## Discussion

### Prevalence of Obesity and Affecting Factors

Firefighting has one of highest frequencies of obesity of any profession. When past studies examining, it can be seen that 11% and 59% of firefighters are obese (Smith et al., 2012; Martin et al. 2019; Damacena et al., 2020). In this study, which was the first in Turkey to consider the prevalence of obesity in firefighters, 52.4% were found to be overweight and 22.5% obese. The results of the study are similar to those of the literature and support the finding that overweight and obesity are widespread among firefighters (Smith et al., 2012; Martin et al. 2019; Damacena et al., 2020).

Firefighters gradually gain weight during the course of their careers (Soteriades et al., 2005). It has been found that the frequency of obesity increased with the number of years worked and with age. Studies in America (Wilkinson et al., 2014) and Hong Kong (Clare et al., 2015) support

this finding. When evaluated according to body mass index, more than half of the firefighters are overweight and obese. However, it is a remarkable finding that few perceive themselves as overweight. Also, it was determined that firefighters who stated that they ate a regular midday meal had a lower frequency of obesity, and that marital status and perception of body type affected the prevalence of obesity.

### Knowledge Levels of the Risk Factors for Cardiovascular Disease

Coronary heart disease is a major public health problem worldwide and firefighters may be at particular occupational risk (Mochtar & Hooper, 2012; Smith et al., 2018). Lifestyle changes are essential for the prevention of cardiovascular diseases, and awareness has an important role in changing the behavior of individuals (Arıkan et al., 2009; Palmer & Yoos, 2019). However, in the studies conducted, the firefighters' risks of cardiovascular disease were high (Yoo & Franke,



2009; Mochtar & Hooper, 2012; Wolkow et al., 2014). In America, it was found that 86% of firefighters did not know their blood fat levels: only 35% had had their blood fat level measured in the previous year, 39% had no tests, and 30% smoked. It was also concluded that most of the firefighters were not aware of the risk factors for cardiovascular disease, and that they did not have enough scans for these risks (Yoo & Franke, 2009). Another study conducted in America, it was found that 45% of firefighters reported a sedentary lifestyle, 23% smoked, 29.7% had dyslipidemia, 68% had two or more risk factors for cardiovascular disease (Martin et al., 2019). In Qatar, it was found that 21.8% of firefighters smoked, and 12.6% had high cholesterol. In addition, 15.5% of the firefighters were found to be at a 10-20% risk of cardiovascular disease (Mochtar & Hooper, 2012). In Australia, the prevalence of coronary heart disease among male firefighters was found to be 19.2%, and the risk of coronary heart disease of 37% of them was high (Wolkow et al., 2014). It was also determined that as in studies conducted in other countries firefighters in this study had behaviors which were risky for cardiovascular diseases. It was determined that 69.4% of the firefighters smoked, 41.5% did not take regular exercise, and 49.7% did not know their cholesterol levels. In addition, even though the BMI of 74.9% of them was 25 or over, only 15% characterized their body type as overweight. In the present study, also the mean CARRF-KL scores were found to be at a medium level. It is thought that healthy lifestyle behavior by firefighters can contribute to risk management, especially in the prevention of coronary artery disease.

**Limitations:** A limitation of this study is that it was done in a single fire station which did not represent the whole population of firefighters in Turkey. Also, cholesterol levels were not determined by blood tests, but were based on the statements of the individuals.

**Conclusion and Recommendations:** It was found that although the prevalence of obesity and the risk factors for cardiovascular diseases such as smoking, obesity, cholesterol levels, and physical exercise levels were widespread, the level of knowledge of the risk factors for cardiovascular diseases was at a medium level. Informing firefighters of the risk factors for cardiovascular disease is important for worker health. In order to reduce these risk factors, it is important to

determine the knowledge levels of firefighters and to carry out training in this regard. Knowledge of the risk factors is important for early diagnosis, and for this, it will be important to increase epidemiological research in firefighters, to re-evaluate sports facilities for physical exercise in the workplace, to carry out regular health checks, to employ more workplace nurses and doctors in order to reduce risks. Finally, fire department initiatives addressing exercise, weight control, healthy diet, and periodic health surveillance should be promoted across the country in order to have a positive impact on the current obesity epidemic.

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