

## Are Industrial Workers Ready to Intervene in Medical Emergencies? A Field Study Conducted in an Organised Industrial Zone

Sanayi Kuruluşlarında Çalışan İşçiler Tıbbi Acillere Müdahaleye Etmeye Hazır Mı? Organize Sanayi Bölgesi'nde Yürütülen Bir Saha Çalışması

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### ABSTRACT

In organised industrial zones, where workplaces of different hazard classes operate, the risk of injury is high. Therefore, it is important that workers, who are prone to accidents, are prepared to intervene in medical emergencies. This study aimed to evaluate the first aid knowledge levels of industry workers and related factors. This descriptive and cross-sectional study was conducted with 444 industrial workers employed in different institutions in an organised industrial zone in a Turkish province. The data were collected using the descriptive information and first aid knowledge forms. The total score first aid knowledge level of the industrial workers who participated in the study was found to be  $19.62 \pm 6.02$ . The findings revealed that the first aid knowledge levels of the industrial workers aged between 36 and 45, married, graduates of high school or a higher educational institution, tenured for more than 1096 days or higher and recipients of first aid training were higher ( $p < 0.05$ ). Although the first aid knowledge levels of the participants were found to be at a moderate level, only a few had good levels of the first aid knowledge. In addition, it was determined that the level of first aid knowledge varies according to age, marital status, education level, working time and receiving first aid training. The identification of industrial workers' first aid knowledge levels and factors affecting these levels can help ensure the safety of industrial workers, improve the quality of prevention and protection measures and foster effective management of crisis situations.

**Keywords:** Emergency, First Aid, Occupational Health, Workers

### ÖZ

Farklı tehlike sınıflarına sahip işyerlerinin faaliyet gösterdiği organize sanayi bölgelerinde yaralanma riski yüksektir. Bu nedenle, kazalara yatkın olan çalışanların tıbbi acil durumlara müdahale etmeye hazır olmaları önemlidir. Bu çalışmada, sanayi çalışanlarının ilk yardım bilgi düzeyleri ve ilişkili faktörlerin incelenmesi amaçlanmıştır. Tanımlayıcı ve kesitsel tipte olan bu araştırma, Türkiye'de bir ilde bulunan organize sanayi bölgesindeki farklı kurumlarda çalışan 444 sanayi işçisi ile gerçekleştirilmiştir. Veriler tanıtıcı bilgi formu ve ilk yardım bilgi formu kullanılarak toplanmıştır. Araştırmaya katılan sanayi çalışanlarının ilk yardım bilgi düzeyi toplam puanı  $19.62 \pm 6.02$  olarak bulunmuştur. Bulgular, 36-45 yaş arası, evli, lise ve üzeri eğitime sahip, 1096 gün ve üzerinde görev yapmış, ilk yardım eğitimi almış sanayi çalışanlarının ilk yardım bilgi düzeylerinin daha yüksek olduğunu ortaya koymuştur ( $p < 0.05$ ). Katılımcıların ilk yardım bilgileri orta düzeyde olmakla birlikte, çok azının ilk yardım bilgisi iyi düzeydeydi. Ayrıca ilk yardım bilgi düzeyinin yaşa, medeni duruma, eğitim düzeyine, çalışma süresine ve ilk yardım eğitimi almaya göre farklılık gösterdiği belirlendi. Sanayi çalışanlarının ilk yardım bilgi düzeylerinin ve bu düzeyleri etkileyen faktörlerin belirlenmesi, sanayi çalışanlarının güvenliğini sağlamaya, önleme ve koruma önlemlerinin kalitesini artırmaya ve kriz durumlarının etkin yönetimini teşvik etmeye yardımcı olabilir.

**Anahtar Kelimeler:** Acil, İlk Yardım, İşçiler, İş Sağlığı

*Nevşehir Hacı Bektaş Veli Üniversitesi ethics committee approved the protocol of the study with a decision number of 2018.05.56 on 19.03.2018.*

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**Geliş tarihi / Received:** 01.01.2023  
**Kabul tarihi / Accepted:** 20.09.2023

## INTRODUCTION

Workplace accidents are preventable, dangerous public health problems that lead to economic losses and affect the entire society.<sup>1,2</sup> Globally, 2.78 million workers are estimated to die from work-related issues every year, of whom 380,000 (13.7%) are believed to decrease as a result of workplace accidents. In addition, it is known that 3.74 million non-fatal workplace accidents occur, 123,000,000 disability-adjusted life years are lost and an economic loss corresponding to 4.94% of the gross domestic product is experienced annually.<sup>3</sup> Although the number of deaths by workplace accidents has shown a decreasing trend in developed countries, in Turkey, the number of work-related deaths has been increasing every year.<sup>4</sup> The industrial sector in Turkey ranks first in terms of occupational accidents (47.7%) and second in terms of fatal workplace accidents (14.1%). In the workforce, one out of every four employees works in the industrial sector. The high number of workplace accidents and the fact that a considerable portion of the population works in the industrial sector increase the risk of work-related injury and death in organised industrial zones (OIZ) in which many industrial institutions (production, manufacturing, processing, storage, etc.) operate in different hazard classes. Moreover, that these zones are isolated and located far from the city centre pose a threat in the management of emergencies, which, in turn, amplifies the importance of the response to medical emergencies.<sup>5</sup>

The World Health Organization emphasises the importance of first aid in the workplace.<sup>5</sup> First aid is defined as interventions that are performed at the scene after accidents or life-threatening situations with the existing medical equipment and without any medications to preserve life or prevent the condition from worsening until professional medical assistance is provided.<sup>6</sup> The importance of first aid, an important element of occupational health and safety, is mostly related to the conscious interventions made until arriving and after arriving at the

scene. Reliable knowledge and skills of first aid and the rapid implementation of first aid are vital, especially in cases where the professional medical team cannot arrive timely at the scene for some reason. Indeed, it has been reported that most deaths owing to injuries in emergency situations can be prevented if first aid is applied before the injured is taken to the emergency room. Therefore, by performing simple but effective first aid practices in a timely manner, it is possible to save the life of the injured, prevent disability or reduce the degree of disability.<sup>7</sup> Extant literature focusing on different worker groups emphasise that the effectiveness of the first aid training is unclear and the knowledge of workers regarding this issue needs to be improved.<sup>8-11</sup> Therefore, effective first aid practices are required in the workplace to prevent workplace injuries and occupational risks.<sup>5,12</sup>

According to a systematic review that mostly addressed studies conducted in European and North American countries, in terms of legislation on and preparation against workplace emergencies, there are differences not only between countries but also between different parts of individual countries.<sup>12</sup> However, in Turkey, the existing health personnel is primarily responsible for the first interventions in cases of a work-related medical emergency and workplaces with less than 50 employees are not obligated to house an occupational health and safety unit. Businesses can instead work with subcontractors called joint health and safety units to provide OHS services at regular intervals and have certain number of employees with knowledge of first aid (support staff) in the workplace.<sup>6,13,14</sup> This may lead to difficulties in managing industrial crises, especially those involving biological agents for which sufficient preparation and exercise are not done (acute health emergencies). For instance, throughout the COVID-19 pandemic, which brought all aspects of life to a halt, industrial establishments continued operating despite

all restrictions. The changes in work and working conditions owing to the pandemic led to the emergence of new work-related health risks and disrupted occupational health services.<sup>3,15,16</sup> In addition, there have been difficulties in implementing first aid interventions requiring close contact in workplaces, and access to emergency health services has been restricted. Consequently, leaving first aid services only to the responsibility of certain people or health professionals may, in complicated crisis situations, lead to the inability to intervene in the situation effectively and additional problems. Hence, it is important that workers who are the first to arrive at the scene of the accident and intervene in the crisis have good levels of first aid knowledge and skills.

Extant literature suggests that the number of studies on the preparedness levels of industrial workers for first aid interventions after workplace accidents is few<sup>8,17,18</sup>

worldwide, including Turkey, and that these studies mostly addressed the prevention of workplace accidents.<sup>10,19-21</sup> Furthermore, it was noted that in these studies, the diversity of industrial institutions and sectors that are investigated is fairly little. Accordingly, as this study reveals the first aid knowledge levels of industrial workers working in 22 institutions across five sectors and the factors affecting these knowledge levels, it is expected to make significant contributions to the literature. This study aims to investigate the first aid knowledge levels of industrial workers working in different industrial institutions in an OIZ and the factors affecting these levels.

#### Research Questions

1. What are the first aid knowledge levels of industrial workers?
2. What are the factors affecting the first aid knowledge levels of industrial workers?

## MATERIAL AND METHOD

### Study Design and Sample

The participants of this descriptive cross-sectional study comprise 742 industrial workers working in 22 different institutions in an OIZ located in a province in the Central Anatolian Region of Turkey, the population of which is 153.157 (Table 1). There was no sample selection; the study aimed to cover the entire population. All industrial workers who were contacted by the researcher and volunteered to participate in the study were asked to fill out a questionnaire. A total of 460 industrial workers volunteered to participate in the study. However, since six workers filled out the questionnaire incompletely/incorrectly and 10 workers were excluded after the pilot study, the population of the study decreased to 444 (62% of the population). A post-power analysis was performed after the measurements were made, and the power of the study was found to be 100 % with an error level of 5% and an effect size of 0.50.

### Data Collection Tools and Their Characteristics

The descriptive information and first aid knowledge forms were used to collect data.

### Descriptive Information Form

The descriptive information form was an 11-question form comprising questions created by the researchers based on the literature that aimed to collect information on the socio-demographic characteristics (age, gender, etc.), work experiences (tenure, sector, etc.) and first aid experiences (whether first aid training was received, a situation where first aid was needed was witnessed, first aid was applied, etc.) of the industrial workers who participated in the study.<sup>8,19,20</sup>

### First Aid Knowledge Form

This form was developed by researchers based on the literature to evaluate the first aid knowledge levels of industrial workers.<sup>2,8</sup> The form comprises 36 statements related to first aid practices for the types of injuries that may occur in cases of workplace accidents.

The themes of the statements are as follows: Basic first aid (9), drowning (1), poisoning (2), CPR (5), bleeding (3), trauma (3), burns and electric shock (3), epilepsy (1), fractures/dislocations/sprains (3), injury (3), and mental fog and fainting (3). Each statement can be answered as 'true', 'false' or 'I don't know'. The answer 'true' corresponds to 1 point, whereas the answers 'false' and 'I don't know' correspond to 0 points. The maximum score that could be obtained from the form is 36, and it was evaluated that the higher the score is, the better the first aid knowledge level is.

For the content validity of the form, opinions of eight experts were sought and the content validity index was calculated to be  $>0.80$ .<sup>22</sup> A pilot study was conducted with 10 industrial workers to test the clarity, comprehensibility and usefulness of the form, and the data obtained were not included in the analysis of the data. No changes were made to the questions after the pilot study. KR-20 value was found to be 0.82.

### Data Analysis

Statistical Package of Social Sciences (SPSS) 21.0 package software was used to examine the data obtained. Number (n),

percent (%), mean ( $\bar{x} \pm sd$ ), median, 25th and 75th percentile values (M [25%–75%]) were used for descriptive features. The Kolmogorov–Smirnov test was employed to assess the normality of the data distribution. Continuous variables were compared using the Mann–Whitney U and Kruskal–Wallis tests. The multiple linear regression analysis was conducted to determine the variables that are predictors of the level of first aid knowledge. The content validity of the first aid knowledge form was measured by seeking expert opinion and calculating the KR-20 value.  $P \leq 0.05$  was considered significant in all tests.

### Ethical Considerations

Before the study, approval from the Ethics Committee of Nevşehir Hacı Bektaş Veli University (Decision No: 2018.05.56) and a written permission from the Directorate of the OIZ where the study was conducted (Decision No: 2018/679) was obtained. Furthermore, before the study, the industrial workers who volunteered to participate in the study were informed about the aim and the benefits of the study as well as the duration of their interview and their consent was obtained.

## FINDINGS AND DISCUSSION

Of the participants (n = 444), the mean age was  $33.23 \pm 9.30$ , 94.1% were male, 73.4% graduated from middle school or a higher educational institution, 71.6% were married, 35.4% worked in the metal sector, 35.4% worked in the automotive and spare parts sector and 91.7% had jobs classified as highly hazardous (Table 2). Of the participants, 59.5% received first aid training and 79.7% had not encountered a workplace accident requiring first aid. Of the industrial workers who participated in the study, 11.3% attempted to provide first aid and 9.9% attempted to call 112 (Table 3).

The first aid knowledge mean score of the participants was found to be  $19.62 \pm 6.02$

(Min: 0, Max: 31) out of 36. The relationship between the participants' socio-demographic characteristics and the median first aid knowledge scores revealed that the median first aid knowledge scores differed significantly by age, education level and marital status ( $p < 0.05$ ). The findings suggested that the participants aged between 36 and 45, who were graduates of high school or a higher educational institution and were married had higher first aid knowledge scores. In terms of job-related characteristics, the results found that participants who were tenured 1096 days or higher had significantly higher first aid knowledge scores ( $p < 0.05$ ; Table 2).

**Table 1. Distribution of Industrial Organizations by Certain Characteristics**

Workplace	Sector	Hazard class	Number of workers employed	Number of workers reached
1	Machine	Very dangerous	60	33
2	Machine	Less dangerous	18	10
3	Machine	Dangerous	5	2
4	Machine	Very dangerous	16	13
5	Machine	Very dangerous	21	13
6	Machine	Very dangerous	15	13
7	Metal	Dangerous	13	3
8	Metal	Very dangerous	6	4
9	Metal	Very dangerous	100	57
10	Metal	Very dangerous	10	7
11	Metal	Very dangerous	100	75
12	Metal	Very dangerous	10	6
13	Metal	Very dangerous	5	5
14	Automotive spare parts	Very dangerous	50	35
15	Automotive spare parts	Very dangerous	20	13
16	Automotive spare parts	Very dangerous	18	11
17	Automotive spare parts	Very dangerous	40	28
18	Automotive spare parts	Very dangerous	24	20
19	Automotive spare parts	Very dangerous	101	50
20	Food packaging	Less dangerous	15	8
21	Food packaging	Less dangerous	45	14
22	Plastic	Very dangerous	50	24
	Sum		742	444

The relationship between certain aspects of the participants' experience with first aid and the median first aid knowledge scores revealed that the median first aid knowledge scores of those who received first aid training, thought that they had moderate knowledge of first aid and believed that they could apply first aid in an emergency were significantly higher ( $p < 0.05$ ) (Table 3).

The model established as a result of the multiple linear regression analysis performed to determine the factors affecting the first aid knowledge levels of the participants was found to be statistically significant ( $p < 0.001$ ). The results of the regression analysis demonstrated that the characteristics of age, education level, tenure and whether first aid training was received were important predictors of the first aid knowledge level of industrial workers (Table 4).

**Table 2. Distribution of First Aid Knowledge Mean Scores and Medians by Socio-demographic and Work-related Characteristics of Workers (n = 444)**

Characteristics	n	%	$\bar{X} \pm SS$ Median (25p%-75p%)	Statistical analysis	p
<b>Age (33.23±9.30)</b>					
15-25	96	21.6	17.92 ± 6.30 19.00(15.00-23.00)	11.395	<b>0.010<sup>a</sup></b>
26-35	176	39.6	19.77 ± 5.83 21.00(17.00-24.00)		
36-45	123	27.7	20.97 ± 5.49 22.00(19.00-25.00)		
46 and above	49	11.0	18.97 ± 6.70 21.00(16.00-23.00)		
<b>Gender</b>					
Female	26	5.9	20.73 ± 4.61 20.00(17.00-24.25)	-4.89	0.625 <sup>b</sup>
Male	418	94.1	19.55 ± 6.10 21.00(17.00-24.00)		
<b>Education level</b>					
Reading-writing	5	1.1	16.40 ± 9.55 19.00(8.50-23.00)	10.877	<b>0.012<sup>a</sup></b>
Primary school	113	25.5	19.06 ± 6.22 20.00(17.00-23.00)		
Middle school	155	34.9	18.78 ± 6.45 20.00(16.00-24.00)		
High school and above	171	38.5	20.84 ± 5.16 22(18.00-24.00)		
<b>Marrital status</b>					
Married	318	71.6	20.14 ± 5.81 21.00(17.00-24.00)	-2.967	<b>0.003<sup>b</sup></b>
Unmarried	126	28.4	18.29 ± 6.36 20.00(15.00-23.00)		
<b>Working duration</b>					

**Table 2. (Continue)**

0-90	115	25.9	17.82 ± 7.04 20.00-15.00-23.00)	16.935	0.002 <sup>a</sup>
91-180	15	3.4	18.66 ± 6.91 19.00(17.00-24.00)		
181-365	49	11.0	19.10 ± 4.72 20.00(16.00-23.00)		
366-1095	86	19.4	19.55 ± 5.76 21.00(17.00-24.00)		
1096 and above	179	40.3	21.02 ± 5.04 22.00(19.00-24.00)		
<b>Sector</b>					
Metal	157	35.4	19.59 ± 6.41 21.00(17.00-24.00)	6.544	0.162 <sup>a</sup>
Machine	84	18.9	18.64 ± 7.19 21.00(17.00-23.00)		
Automotive spare parts	157	35.4	19.65 ± 5.06 20.00(17.00-23.00)		
Plastic	24	5.4	22.12 ± 6.05 22.50(20.00-27.75)		
Food packaging	22	5.0	20.59 ± 3.77 19.50(17.00-24.25)		
<b>Hazard Class</b>					
Very dangerous	407	91.7	19.7 ± 6.15 21.00(17.00-24.00)	4.869	0.88 <sup>a</sup>
Dangerous	5	1.1	24.60 ± 2.88 24(22.00-27.50)		
Less dangerous	32	7.2	20.65 ± 44.13 20.50(18.00-23.00)		

a Kruskal–Wallis Test, b Mann–Whitney U Test

This study aimed to investigate the first aid knowledge level of the workers working in an organised industrial zone and the factors affecting it. Consequently, the participants were found to have a moderate

level of first aid knowledge. Among the important predictors of the first aid knowledge level were workers' age, education level, tenure and whether they received first aid training.

**Table 3. Distribution of First Aid Knowledge Mean and Median Scores by the Workers' First Aid Experiences (n = 444)**

Characteristics	n	%	$\bar{X} \pm SS$ Median (25p%-75p%)	Statistical analysis	p
<b>Having received first aid training</b>					
Yes	264	59.5	20.41 ± 5.39 21.00(17.50-24.00)	-3.001	<b>0.003<sup>a</sup></b>
No	180	40.5	18.65 ± 6.29 20.00(16.00-23.00)		
<b>Having encountered a workplace accident that required first aid</b>					
Yes	90	20.3	20.21 ± 5.42 21.00(17.00-24.00)	-.642	0.412 <sup>a</sup>
No	354	79.7	19.47 ± 6.17 21.00(17.00-24.00)		
<b>Having provided first aid</b>					
Yes	50	11.3	20.68 ± 6.02 22.00(17.00-25.00)	-1,519	0.129 <sup>a</sup>
No	394	88.7	19.48 ± 6.02 21.00(17.00-24.00)		
<b>Having called 112 for a reason</b>					
Yes	44	9.9	20.84 ± 6.20 22.00(19.00-24.75)	-1.670	0.095 <sup>a</sup>
No	400	90.1	19.48 ± 6.00 21.00(17.00-24.00)		
<b>Own perception of the level of first aid knowledge</b>					
Good	44	9.9	19.95 ± 5.08 20.00(17.00-23.00)	9.343	<b>0.009<sup>b</sup></b>
Moderate	320	72.1	20.11 ± 5.69 21.00(17.00-24.00)		
Bad	80	18.0	17.45 ± 7.26 20.00(15.50-22.50)		
<b>Own perception on the capability of administering first aid in emergencies</b>					
Yes	224	50.5	21.07 ± 5.08 22.00(19.00-24.75)	26.761	<b>p &lt; 0.001<sup>b</sup></b>
No	170	38.3	18.45 ± 6.13 19.00(16.00-23.00)		
Undecided	50	11.3	17.08 ± 7.74 19.00(15.00-22.50)		

a: Mann–Whitney U Test, b: Kruskal–Wallis Test

The first significant finding of this study is that the mean first aid knowledge score of the participants was 19.62 out of 36. Similar results were obtained in Turkish studies conducted with different worker groups. However, contrary to the literature, this study was conducted with a large population of workers working in 22 industrial establishments across five different industries. The number of studies where the first aid knowledge levels of industrial workers are investigated is scarce both in Turkey and worldwide, and these studies were generally conducted with workers from few workplaces and sectors.<sup>8,10,18</sup> Aytac, Gok and Özkan<sup>8</sup> found the median first aid knowledge score of furniture factory workers

to be 54.1 out of 100. In their study, Karadağ, Taşdemir, Parlar Kılıç and Kul<sup>17</sup> found that 70% of textile workers reported a need for the first aid training. In their study, Cengiz and Yer<sup>18</sup> found that the median first aid knowledge score of miners was 68.47 out of 100. It is held that the reason behind miners' higher median first aid knowledge score is the 'Soma mining accident' that occurred in 2014, which resulted in the highest casualty (301 people) in the mining history of Turkey; owing to this incident, both employers and employees in the mining industry took the issue severely. It was found that the high-risk industry workers in Vietnam, mine workers in Sudan and workers in Egypt had low levels of first aid knowledge.<sup>9-11</sup> It was

reported that these results may be due to personal, professional, managerial, legal and training-related factors.<sup>23,24</sup> The findings of this study show that the participants do not possess the desired level of knowledge to manage an accident. However, other important findings of this study that need to be emphasised are that most participants (81.8%) do not possess a sufficient level of first aid knowledge and the rate of those who believe they can unhesitantly perform first aid in medical emergencies is quite high (50.5%). It can be inferred that industrial workers are likely to perform first aid intervention, despite having insufficient knowledge on the subject; therefore, workers should be informed about the complications

related to incorrect implementation of first aid and the problems that may arise owing to it. However, according to the first aid regulation, workplaces are obligated to have a first aider for every 20 employees in low-hazard workplaces, for every 15 employees in hazardous workplaces and for every 10 employees in extremely hazardous workplaces 6. When calculated according to the relevant provisions of the regulation (%10.2), it is observed that the workplaces of which the workers participated in this study have fulfilled the legal obligation (%18.2). Therefore, these findings can be important in illuminating the invisible face of the iceberg and raising the necessary awareness.

**Table 4. Evaluation of Factors Affecting First Aid Knowledge Score with the Multiple Regression Model (n = 444)**

Variables	$\beta$	SE	t	p values	F model	p model	R <sup>2</sup>
Age (15–25 /46 and above)	-0.115	0.648	-2.285	0.023**			
Education level (Primary school dropout/primary school)	-0.100	0.659	-2.064	0.040**			
Marital Status (Married)	0.081	0.710	1.517	0.130	6.753	0.000*	0.063
Years	0.132	0.000	2.720	0.007**			
Having received first aid training (Yes)	0.110	0.587	2.309	0.021**			

\* p < 0.001, \*\* p < 0.05

The second important finding of the study is that the first aid knowledge scores of workers aged below 26 and over 45, primary school dropouts or graduates and those who had little experience were lower. In two different studies conducted with industrial and electrical workers, it was reported that the higher the position was, the better the first aid knowledge was and that this result may be due to longer tenure and more training programmes attended by the workers.<sup>18,24,25</sup> Another striking finding of this study that should be emphasised is that Koczorowska<sup>26</sup> reported that employee age is an important variable affecting the first aid

the first aid knowledge levels of the workers aged between 15 and 25 were the lowest. Moreover, the number of workplace accidents was reported to be high among this age group.<sup>19</sup> These findings are important in indicating that the workers in this age group should be closely monitored and necessary OHS measures should be taken. Another important finding is that the first aid knowledge levels demonstrated a decreasing trend with workers aged 46 and over. Zalewski, Przymusala, Klosiewicz, Dabrowski, Marciniak and Cerbin-competency. Once again, these findings highlight the fact that ‘worker age and

suitability for work (physical strength, functional fitness, etc.)' should be emphasised in the industrial sector and there may be reasons that need investigation. It is an expected result that the higher the education level is, the higher the level of first aid knowledge is; this is consistent with the findings of extant literature<sup>8,18</sup> The increase in educational level may positively affect awareness of the subject and the tendency to participate in relevant training programmes.

Of the participants of this study, 59.5% had received the first aid training, and they were found to be more knowledgeable on the subject than their colleagues who had not. However, only 18.2% of the participants received high first aid knowledge scores. These findings suggest that the first aid training programmes provided did not produce the desired outcome. This finding corresponds to the findings of different studies in the literature that were conducted with several worker groups. It was noted in other studies in the literature that training programmes encompassing activities such as didactic lessons, practical demonstrations, skill development exercises and case studies improved the first aid knowledge and skills of the participants; however, this improvement was reversed after three months.<sup>27,28</sup>

In other studies, it was emphasised that although improvement was observed after the

training programmes, several factors affecting the outcomes of the training programmes, namely the level of knowledge gained in school programmes, sources of information (design, access, etc.), content, duration, number and timing of the sessions, suitability of the training for the group (learning pace, etc.), variety of methods employed, the evaluation criteria, the age and continuity of exposure to training, the quality of the training environment and trainers, voluntariness and legal obligations for workplaces on first aid training, may have an effect on the retention of the knowledge gained.<sup>10,12,24,25,29-32</sup> The findings demonstrate that practice and continuity in the first aid training are important, but sufficient knowledge retention cannot be achieved.

### Strengths and Limitations of the Study

The strength of the study is that it is the first in the literature that includes a large worker population, working in numerous industrial establishments across five different industries. However, the study has certain limitations. The lack in the literature of a standardised evaluation method for the first aid knowledge poses a limitation in comparisons.<sup>31</sup> Furthermore, the findings of the study are generalisable to workers working in the institutions involved in the study.

## CONCLUSIONS AND SUGGESTIONS

As a result of the study, it was found that the first aid knowledge levels of the industrial workers working in an OIZ are at the moderate level and vary by age, education level, tenure and whether first aid training is received. The findings of this study may contribute to the reduction of incorrect first aid practices, which may harm worker health and life, and the problems owing to these practices. In addition, this study draws on whether the existing legal obligations regarding first aid services are adequate in managing extraordinary workplace crises, the importance of effective

first aid training and the provision of such training to all workers. Considering the portion of the population who work in the industrial sector, the complexity of industrial workplaces, the additional problems owing to extraordinary cases and the legal liabilities arising from workplace accidents, it is imperative to develop effective first aid systems offering the capacity to respond to complex crisis situations. Furthermore, it is recommended to take necessary steps for the development of the relevant training methods and environments within the framework of OHS policies.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Acknowledgments

We thanks to all participants who contributed to this study.

## Declaration of competing interest

The authors declare no competing interest.

## Author's contributions

Study conception and design: ŞŞK, RK; collection of data: ŞŞK, RK, GKÇ, MSK; analysis and interpretation of data: ŞŞK, RK; drafting of manuscript and critical revision: ŞŞK, RK, GKÇ. All authors read and approved the final manuscript.

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