

Examining Preparedness Perception and Crisis Management for CBRN-E Incidents in Healthcare

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ABSTRACT

This study aimed to examine the relationship between the perception of preparedness for Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) events and the crisis management level of personnel working in the field of health. The population and sample of the research consists of the personnel serving at Atatürk State Hospital in Düzce province. In this context, 475 people who voluntarily contributed to the study constitute the sample of the research. The population of the research is 1041 people. There is no significant difference between all sub-dimensions of the CBRN-E incident preparedness perception and crisis management scales according to gender ($p>0.05$). There is a statistically significant difference between the preparedness perception scores of those who took part in CBRN-E incidents ($p<0.05$). There is a statistically significant difference between all sub-dimensions of the preparedness perception scale and the pre-crisis activities dimension of those who have previously received CBRN-E training ($p<0.05$). According to regression analysis modelling, CBRN-E event preparedness perception dimensions have a significant effect on the pre-crisis activities dimension ($p<0.05$). This study emphasizes the importance of all hospital personnel receiving training on CBRN-E.

Keywords: Crisis management, CBRN-E, Health, Hospital, Preparedness

Sağlık Alanında KBRN-E Olaylarına Yönelik Hazırlık Algısı ve Kriz Yönetiminin İncelenmesi

Öz

Bu çalışma, Kimyasal, Biyolojik, Radyolojik, Nükleer ve Patlayıcı (CBRN-E) olaylara hazırlık algısı ile sağlık alanında çalışan personelin kriz yönetimi düzeyi arasındaki ilişkiyi incelemek amacıyla yapılmıştır. Araştırmanın evreni ve örneklemini, Düzce ilindeki Atatürk Devlet Hastanesi'nde görev yapan personelden oluşmaktadır. Bu bağlamda, çalışmaya gönüllü olarak katılan 475 kişi araştırmanın örneklemini oluşturmaktadır. Araştırmanın evreni 1041 kişiden oluşmaktadır. CBRN-E olaylarına hazırlık algısı ve kriz yönetimi ölçeklerinin tüm alt boyutlarında cinsiyete göre istatistiksel olarak anlamlı bir fark bulunmamaktadır ($p>0,05$). CBRN-E olaylarına daha önce katılmış olanların hazırlık algısı puanları arasında istatistiksel olarak anlamlı bir fark bulunmaktadır ($p<0,05$). Daha önce CBRN-E eğitimi almış olanların hazırlık algısı ölçeğinin tüm alt boyutları ile kriz öncesi faaliyetler boyutu arasında istatistiksel olarak anlamlı bir fark bulunmaktadır ($p<0,05$). Regresyon analizi modellemesine göre, CBRN-E olaylarına hazırlık algısı boyutları, kriz öncesi faaliyetler boyutu üzerinde anlamlı bir etkiye sahiptir ($p<0,05$). Bu çalışma, tüm hastane personelinin CBRN-E konusunda eğitim almasının önemini vurgulamaktadır.

Anahtar Kelimeler: Hastane, Hazırlık, KBRN-E, Kriz yönetimi, Sağlık

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Atıf / Citation: Demircan, E., Oran, F. Ç. (2026). Examining the Perception of Preparedness and Crisis Management Level for Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Incidents in the Field of Health. *Journal of Disaster and Risk*, 23 (8). <https://doi.org/10.35341/afet.1760470>

Publication Note: Bu çalışma, Esra Demircan tarafından Doç. Dr. Feyza Çağla Oran danışmanlığında Tekirdağ Namık Kemal Üniversitesi Sağlık Bilimleri Enstitüsü Acil Yardım ve Afet Yönetimi Anabilim Dalı bünyesinde hazırlanan ve 2024 yılında tamamlanan "Sağlık alanında kimyasal, biyolojik, radyolojik, nükleer ve patlayıcı (KBRN-P) olaylara hazırlık algısı ve kriz yönetimi düzeyinin incelenmesi" başlıklı yüksek lisans tezinden üretilmiştir. / This article is derived from the Master's thesis titled "Examining the perception of preparedness and crisis management level for chemical, biological, radiological, nuclear and explosive (CBRN-P) incidents in the field of health", completed in 2024 by Esra Demircan under the supervision of Assoc. Prof. Dr. Feyza Çağla Oran at the Department of Emergency Aid and Disaster Management, Institute of Health Sciences, Tekirdağ Namık Kemal University.

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1. INTRODUCTION

CBRN is an acronym for Chemical, Biological, Radiological and Nuclear. The term CBRN refers to situations in which these agents are deliberately (knowingly and intentionally/for terrorist purposes) or accidentally released, causing harm and danger to humans and the environment (AFAD, 2014).

This study argues that hospitals need to respond holistically and prepare as a team for CBRN-E incidents by including hospital personnel other than healthcare professionals. Based on the understanding that the strength of a team is only as great as its weakest link, it is recommended that all employees, especially healthcare personnel, participate in training and drills for CBRN-E incidents requiring specialized diagnosis, treatment, care, and hygiene, and that these trainings be implemented routinely. Therefore, the perceived level of preparedness for CBRN-E incidents and the level of crisis management among all hospital personnel were evaluated as a whole, and the relationship between them was examined using a survey technique.

A CBRN incident can be described as an event that cannot be handled with local resources, requires national and international assistance, and affects social order. Throughout history, CBRN agents have been used many times to weaken the enemy, reduce their effectiveness, and create a state of exhaustion, rendering them defenceless. (Sezigen, 2009; Hitti et al., 2026). The effects of CBRN agents can cause burns, injuries, infections, illnesses, disabilities, death, etc., depending on the type of agent, the conditions of the area where the incident occurred (weather, terrain, time, etc.), the environment (air, water, soil, etc.), and the exposure of living beings. (Dökmeci, 2018).

Healthcare personnel, who are at the forefront from the very beginning in CBRN-E incidents that affect large populations and create a crisis environment, also participate in rehabilitation efforts after the incident. All healthcare workers, who provide uninterrupted service even in disasters and emergencies, must be prepared for CBRN-E incidents and have knowledge about what needs to be done during and after the incident.

A lack of information about CBRN-E threats and dangers can occur among victims and patients, as well as among workers, and can lead to problems such as difficulties in intervention and management. In CBRN-E incidents, which require crisis management skills, ensuring team unity and eliminating information gaps are among the responsibilities of the Ministry of Health and hospital administrators. (Resmi Gazete, 2020).

The perception of preparedness for CBRN events follows a similar cycle to disaster management processes. Activities corresponding to the response and recovery phases in the disaster management cycle constitute the crisis management process. Risk and crisis management cannot be discussed in a process where preparedness awareness has not been established. In CBRN incidents, it is necessary to establish hospital incident management centers, manage logistics, manage communications, establish decontamination units, and manage human resources correctly and actively during the crisis. The smooth execution of all these crisis processes is only possible with the internalization of preparedness awareness among all personnel. Preparedness awareness activities for CBRN incidents are examined in three main parts: preparedness, response, and recovery. The preparedness phase includes CBRN training, CBRN drills, the level of volunteerism of personnel in CBRN training, and the establishment of a communication chain for CBRN incidents. The response phase consists of activities and competency levels that include the ability to actively implement CBRN training, the competence to perform triage in CBRN incidents, the ability to know and apply information about contamination in CBRN incidents, and the conscious use of personal protective equipment by personnel. Finally, the recovery phase, i.e., the post-disaster phase, consists of psychological support and resilience in CBRN incidents, the level of volunteerism to transfer intervention and knowledge accumulated in CBRN incidents, and supporting the implementation of support services after CBRN incidents. From this perspective, the development of crisis management skills in CBRN-E incidents primarily depends on the preparedness awareness and application competencies of all professionals working in the relevant field. Although institutions try to develop the preparedness, risk, and crisis management skills of their employees through measures, training, and drills to be prepared for CBRN-E incidents resulting from natural disasters or

accidents, it is sometimes difficult to control such incidents. It is necessary to prepare separately for each CBRN-E substance and assess the possible risks in advance. Personnel who will be primarily affected by accidents or releases caused by natural or technological disasters can be expected to overcome the crisis management process with minimal loss and damage by effectively preparing for CBRN-E incidents during the risk management phase.

Healthcare personnel, who are at the forefront from the very beginning in CBRN-E incidents that affect large populations and create a crisis environment, are also involved in rehabilitation efforts after the incident. All employees in the healthcare sector, who provide uninterrupted service even in disasters and emergencies, must be prepared for CBRN-E incidents and be knowledgeable about what needs to be done during and after an incident. From this perspective, it is particularly important for healthcare professionals to be prepared for CBRN-E incidents and to have developed crisis management skills for these processes. The main objective of the study is to examine the relationship between the preparedness perception and crisis management level of healthcare personnel regarding chemical, biological, radiological, nuclear, and explosive (CBRN-E) incidents and to raise awareness among professionals working in the field.

In general, this study emphasizes the importance of training healthcare personnel on CBRN-E issues. It is believed that involving all hospital personnel in institutional training and drills, along with utilizing alternative training methods, could be effective in increasing the level of knowledge about CBRN-E incidents and in preparedness perception and crisis management processes. Furthermore, since the study examines the crisis management and preparedness perception of CBRN-E incidents, it maintains its originality in the relevant field.

The research question is: "What is the relationship between the preparedness perception and crisis management level of healthcare personnel in response to CBRN-E incidents?"

The study's hypotheses are as follows: There is a significant difference in healthcare workers' perceptions of preparedness for chemical, biological, radiological, and nuclear (CBRN) incidents and their crisis management levels across demographic variables such as age, gender, education level, job title, years of professional experience, years of service in the institution, previous participation in CBRN incidents, and prior CBRN training. The main hypothesis was formulated as follows: "Healthcare workers' perception of preparedness for CBRN-E incidents has a significant effect on their crisis management level." This hypothesis was analyzed.

2. METHODS

The aim of this study is to examine the relationship between healthcare workers' perception of preparedness for chemical, biological, radiological, nuclear and explosive (CBRN-E) incidents and their level of crisis management.

In this research, the correlation research type, which is one of the quantitative research methods, was used by employing the convenience sampling method, and the data was collected using the survey technique. This method is preferred because it is fast, low-cost, and selects the closest and most accessible subjects. However, it carries a high risk of bias because it does not reflect the entire population.

The universe and sample of the study consist of personnel working at Atatürk State Hospital in Düzce Province. The sample for the study consists of 475 people, while the population consists of 1,041 people. All hospital staff working in the healthcare field, including doctors, midwives/nurses, paramedics, health officers, anesthesia technicians, laboratory technicians, radiology technicians, and others (security guards, cleaning staff, administrative staff, etc.), who voluntarily participate in the research and answer all survey questions completely and accurately were included in the study. Those who do not work in the healthcare field and who work outside of Düzce Atatürk State Hospital, which constitutes the research population, will not be included in the study. To conduct the research, ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Tekirdağ Namık Kemal University on 28/03/2023 with

approval number 2023.50.03.09. Statistical power analysis was applied to determine the sample size of the study. Power values for different sample sizes were calculated using G*Power software (Figure 1). The results were determined within a 95% confidence level ($p < 0.05$) when calculating power values.

Options:	exact distribution		
Analysis:	Post hoc: Compute achieved power		
Input:	Tail(s)	=	Two
	Correlation ρ H1	=	0.3
	α err prob	=	0.05
	Total sample size	=	280
	Correlation ρ H0	=	0
Output:	Lower critical r	=	-0.1172505
	Upper critical r	=	0.1172505
	Power ($1 - \beta$ err prob)	=	0.9992968

Figure 1. G*Power Result

The limitations of the study include that it is restricted to the state hospital in Düzce province due to limited transportation and financial resources. Other limitations include staff members being absent from their workplaces due to leave, sick leave, etc., during the survey period, and the refusal of voluntary participation in the study. This study was designed to reach all personnel who voluntarily agreed to participate in the research. The scope of this study is limited to a single state hospital in one province. In this context, the study does not represent all of Turkey or the world. The reasons for the limited sample size include the heavy workload of hospital personnel, who are preferred in statistical studies, and the excessive number of in-house training sessions. According to the research results, the idea of receiving additional training leads to a reluctance to participate and causes a limitation in the sample size.

The Demographic Characteristics Form, the CBRN-E Incident Preparedness Perception Scale adapted by Kızılkaya (2020), and the Crisis Management Scale developed by Çalışkan (2020) were used to collect data for the study. In the CBRN Event Preparedness Perception Scale, Kızılkaya (2020) determined that the variance explained by the sub-dimensions was 25.48%, 20.14%, and 10.36%, respectively, resulting in a total explained variance of 55.98%. The Cronbach Alpha coefficient for the entire scale was 0.854; the Cronbach Alpha coefficients for the sub-dimensions were 0.863, 0.873, and 0.664, respectively, and the item-total correlation was found to be higher than 0.20 (ranging from 0.25 to 0.65) for all items in the scale. To determine the reliability of the Crisis Management Scale, Çalışkan (2020) subjected each of the three sample groups to the Cronbach Alpha test separately, calculated the internal consistency of the crisis management variable as a whole and its sub-dimensions of pre-crisis, during-crisis and post-crisis activities, and found that the scale has a high level of reliability. Cronbach Alpha coefficients for the sub-dimensions were 0.89, 0.97 and 0.92.

In the statistical analysis phase of the study, frequency analysis was first applied to examine the demographic characteristics of the healthcare workers included in the study. Then, the scores for the dimensions of the 'CBRN-E Incident Preparedness Perception Scale' and 'Crisis Management Scale' administered to the workers were calculated, and statistics for these scores were provided. Reliability analysis was applied to test the internal consistency of the items within the dimensions of the scales (Cronbach's alpha coefficient). Comparison tests were performed between specific characteristics and the average scores of the subscales and overall average scores of the scale. Prior to the comparison, normality was assessed for each group using skewness-kurtosis and graphical methods, and parametric tests were applied. The mean comparisons of variables with two groups were evaluated using the independent samples t-test. For variables with at least three groups, if variance homogeneity was ensured, ANOVA was used for mean comparisons; if not, the Welch test was used for evaluation. As a result of the comparisons of variables with at least three groups, significant intergroup multiple comparisons (post hoc) were examined using the Tukey test when variances were homogeneous and the Tamhane test when they were not. The error margin was taken as 5% in the evaluation of statistical hypothesis tests. Linear regression analysis was used to create regression models to

test the effect of the independent variable on the dependent variable. The error margin was set at 5% and significance was assessed at $p < 0.05$ in the evaluation of statistical tests. All analyses were performed using IBM SPSS 26 and R Project (R Core Team. 2023) software.

3. FINDINGS

The findings obtained from the research are presented in tables below.

Table 1 shows that 67.2% (n=319) of participants with an average age of 33.99 are female and 32.8% (n=156) are male.

In the analysis of educational levels, it was observed that the majority of participants had a bachelor's degree, accounting for 44.6% (n=212). Midwives/nurses had the highest participation rate, accounting for 32.8% (n=156).

Table 1. Demographic Findings Related to Individuals

Variable	n	%
Age	33.99±8.93	
Gender		
Female	319	67.2
Male	156	32.8
Educational status		
High school	73	15.4
Associate degree	121	25.5
Bachelor's degree	212	44.6
Postgraduate degree	69	14.5
Occupation		
Doctor	65	13.7
Midwife/Nurse	156	32.8
ATT	2	0.4
Health officer	53	11.2
Technician (anaesthesia, laboratory, X-ray)	66	13.9
Other	133	28.0
Years of experience in profession		
0-5	186	39.2
6-10	90	18.9
11-15	52	10.9
16-20	75	15.8
21 and above	72	15.2
Years of experience in institution		
0-5	264	55.6
6-10	78	16.4
11-15	38	8.0
16-20	54	11.4
21 and above	41	8.6
Have you previously been involved in a CBRN-E incident?		
Yes	38	8.0
No	437	92.0
Have you previously received CBRN-E training?		
Yes	119	25.1
No	356	74.9
If you have not previously received CBRN-E training, would you like to receive CBRN-E training on a voluntary basis?		
Yes	159	38.5
No	254	61.5

Table 2 presents the statistics for all dimensions of the measurement tools used in the study. According to these findings, the average perception of participants' preparedness phase is 23.688, the average perception of the intervention phase is 26.253, and the average perception of the post-disaster phase is 15.718.

Table 2. Statistics on Measurement Tools Used in the Study

Dimension	mean	SD	Min	Max	Cronbach's Alpha
Preparation Phase	23.688	5.077	6	30	0.937
Intervention Phase	26.253	7.459	9	45	0.895
Post-Disaster Phase	15.718	3.998	5	25	0.806
CBRN-E Preparedness Perception Scale	65.659	12.508	20	100	0.900
Pre-Crisis Activities	31.126	6.782	9	45	0.911
During-Crisis Activities	33.017	7.889	10	50	0.948
Post-Crisis Activities	13.592	3.456	4	20	0.928
Crisis Management Scale	77.735	16.854	23	115	0.966

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale, Mean: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, Alpha: Reliability coefficient

Table 3 shows the results of the relationship between the ages of the individuals included in the study and their scores on the CBRN-E preparedness perception scale and crisis management scale. The findings reveal a statistically significant, low-intensity, positive difference between the age of individuals and their scores on the CBRN-E Response phase dimension ($p < 0.05$). Upon examining this relationship, it is observed that as the age of individuals increases, their scores on the CBRN-E Response phase dimension also increase.

Table 3. Relationships between Individuals' Ages and Their Scores on the CBRN-E Event Preparedness Perception Scale and Crisis Management Scale

Dimension	Value	Age
CBRN-E Preparation Phase	<i>r</i>	-0.027
	<i>p</i>	0.555
CBRN-E Intervention Phase	<i>r</i>	0.106
	<i>p</i>	0.020
CBRN-E Post-Disaster Phase	<i>r</i>	0.006
	<i>p</i>	0.901
CBRN-E Total	<i>r</i>	0.054
	<i>p</i>	0.238
CMS Pre-Crisis Activities	<i>r</i>	0.054
	<i>p</i>	0.241
CMS During-Crisis Activities	<i>r</i>	0.027
	<i>p</i>	0.562
CMS Post-Crisis Activities	<i>r</i>	0.012
	<i>p</i>	0.797
CMS	<i>r</i>	0.037
	<i>p</i>	0.426

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale, *r*: Correlation coefficient, *p*: Significance value, CMS: Crisis Management Scale

Table 4 presents the results of the comparison of the perception of preparedness for CBRN-E incidents and crisis management dimensions according to gender variables. According to the findings, there is a statistically significant difference between the intervention phase scores of women and men on the CBRN-E incident preparedness perception scale ($p < 0.05$). Upon examination of this difference, the intervention phase scores of women are significantly lower than those of men.

Table 4. Comparisons of Preparedness Perceptions and Crisis Management Dimensions for CBRN Incidents According to Gender Variables

Dimension	Value	Mean	SD	Min	Max	Test statistic	P
CBRN-E Preparation Phase	Female	23.765	4.887	6	30	0.452	0.652 ^t
	Male	23.532	5.458	6	30		
CBRN-E Intervention Phase	Female	25.693	7.265	9	45	-2.350	0.019^t
	Male	27.397	7.739	9	45		
CBRN-E Post-Disaster Phase	Female	15.787	3.970	5	25	0.537	0.592 ^t
	Male	15.577	4.066	5	25		
CBRN-E Total	Female	65.245	12.186	20	100	-1.033	0.302 ^t
	Male	66.506	13.143	32	100		

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Incident Preparedness Perception Scale, CMS: Crisis Management Scale, Mean: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, t: Independent samples t-test

Table 5 presents the comparison results of the scores for the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to education levels. There is a statistically significant difference in the scores for the crisis-related activities dimension based on individuals' educational levels ($p < 0.05$). Upon examining these differences, it is observed that the scores for the crisis-related activities dimension are significantly higher for individuals with high school and associate degree levels compared to those with postgraduate degrees.

Table 5. Comparison of Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions According to Educational Level

Dimension	Value	Mean	SD	Min	Max	Test statistic	p
CMS During-Crisis Activities	High school	34.192	8.767	10	50	3.956	0.008^F (a,b>d)
	Associate degree	34.405	8.235	10	50		
	Bachelor's degree	32.547	7.157	11	50		
	Postgraduate	30.783	7.948	10	50		

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale CMS: Crisis Management Scale, Mean: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, W: Welch test, F: Anova test

Table 6 presents the comparison results of participants' scores on the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to occupational groups.

There is a statistically significant difference between the score points of individuals in different occupational groups on the CBRN-E incident preparedness perception (total) scale dimension ($p < 0.05$).

When these differences are examined, the score points of participants in the midwife-nurse occupational group on the CBRN-E incident preparedness perception (total) scale are significantly higher than those of individuals in other occupational groups.

Table 7 presents the comparison results of participants' scores on the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to their years of professional experience. There is a statistically significant difference between the score points of the CMS Pre-Crisis Activities and CMS (Crisis Management Scale) dimensions according to the individuals' years of professional experience ($p < 0.05$). When these differences are examined, the score points for the CMS pre-crisis activities and CMS (Crisis Management Scale) dimensions of individuals with 6-10 years of work experience are significantly lower than those of employees with 21 years or more of work experience.

Table 6. Comparison of Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions by Occupational Group

Dimension	Value	Mean	SD	Min	Max	Test statistic	p
CBRN-E Total	Doctor	66.585	12.384	25	95	3.336	0.044^W (b>f)
	Midwife / Nurse	68.378	10.825	20	100		
	ATT	65.000	16.971	53	77		
	Health officer	64.245	15.456	40	100		
	Technician (anaesthesia, laboratory, X-ray)	66.667	11.213	43	90		
	Other	62.090	12.975	27	94		

CBRN-E Incident Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Incident Preparedness Perception Scale, CMS: Crisis Management Scale, Avg: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, W: Welch test, F: ANOVA test

Table 7. Comparison of Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions According to Years of Professional Experience

Dimension	Value	Mean	SD	Min	Max	Test statistic	p
CMS Pre-Crisis Activities	0-5 ^a	31.624	6.916	9	45	3.122	0.015^F (b<e)
	6-10 ^b	29.767	7.449	9	45		
	11-15 ^c	30.673	5.779	17	45		
	16-20 ^d	30.040	7.210	9	44		
	21 and above ^e	33.000	5.176	22	45		

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale, CMS: Crisis Management Scale, Avg: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, F: ANOVA test

Table 8 presents the comparison results of the participants' scores on the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to their years of service at the institution. When examining these results, there is no statistically significant difference between the score points of individuals in different years of service at the institution in terms of the CBRN-E Preparedness phase, CBRN-E Response phase, CBRN-E Post-Disaster phase, CBRN-E Total, pre-crisis activities, during-crisis activities, post-crisis activities, and CMS (Crisis Management Scale) score dimensions.

Table 9 presents the comparison results of the participants' scores on the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to their previous involvement in CBRN-E incidents. When examining these results, there is no statistically significant difference between participants who have previously been involved in CBRN-E incidents and those who have not in terms of pre-crisis activities, crisis activities, post-crisis activities, and CMS (Crisis Management Scale) scores ($p>0.05$). According to the findings, there is a statistically significant difference between the scores of participants who had previously been involved in CBRN-E incidents and those who had not been involved in CBRN-E incidents on the CBRN-E incident preparedness perception scale and its sub-dimensions ($p<0.05$). When these differences are examined, the scores of individuals who had previously been involved in CBRN-E incidents on the CBRN-E incident preparedness perception scale and its sub-dimensions are significantly higher than those of individuals who had not been involved.

Table 8. Comparison of Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions According to Years of Service at the Institution

Dimension	Value	Mean	SD	Min	Max	Test statistic	p
CBRN-E Total	0-5	65.455	11.669	27	100	1.41	0.235 ^W
	6-10	67.269	13.365	33	100		
	11-15	68.289	9.731	47	90		
	16-20	62.741	15.771	20	100		
	21 and above	65.317	13.201	25	94		
CMS	0-5	76.807	16.892	23	115	1.006	0.404 ^F
	6-10	78.962	17.033	36	115		
	11-15	79.053	14.448	52	115		
	16-20	76.537	19.813	23	115		
	21 and above	81.732	13.773	54	114		

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale, CMS: Crisis Management Scale, Mean: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, W: Welch test, F: Anova test

Table 9. Comparison of Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions Based on Previous Involvement in CBRN-E Incidents

Dimension	Value	Mean	SD	Min	Max	Test statistic	p
CBRN-E Preparation Phase	Yes	25.658	4.504	10	30	2.507	0.012 ^t
	No	23.517	5.092	6	30		
CBRN-E Intervention Phase	Yes	32.184	7.703	9	45	2.525	<0.001 ^t
	No	25.737	7.219	9	45		
CBRN-E Post-Disaster Phase	Yes	17.684	3.735	8	25	3.191	0.002 ^t
	No	15.547	3.979	5	25		
CBRN-E Total	Yes	75.526	13.432	33	100	5.208	<0.001 ^t
	No	64.801	12.065	20	100		

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Incident Preparedness Perception Scale, CMS: Crisis Management Scale, Mean: Average, SD: Standard deviation, Min: Minimum, Max: Maximum, t: Independent samples t-test

Table 10 presents the comparison results of the participants' scores on the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to whether they had previously received CBRN-E training. Based on these results, there is no statistically significant difference between participants who have previously received CBRN-E training and those who have not in terms of crisis response activities, post-crisis activities, and crisis management scale (CMS) scores ($p>0.05$). According to the findings, there is a statistically significant difference between participants who have and have not previously received training in CBRN-E incidents in terms of all dimensions of the CBRN-E incident preparedness perception scale and the score points for the pre-crisis activities dimension ($p<0.05$). When these differences are examined, the scores of individuals who had previously received training in CBRN-E incidents on all dimensions of the CBRN-E incident preparedness perception scale and the pre-crisis activities dimension are significantly higher than those of individuals who had not received training.

Table 10. Comparison of Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions Based on Previous CBRN-E Training

Dimension	Value	Mean	SD	Min	Max	Test statistic	p
CBRN-E Preparation Phase	Yes	25.042	4.486	10	30	3.397	0.001^t
	No	23.236	5.187	6	30		
CBRN-E Intervention Phase	Yes	30.395	6.799	9	45	7.382	<0.001^t
	No	24.868	7.158	9	45		
CBRN-E Post-Disaster Phase	Yes	17.227	3.494	8	25	5.228	<0.001^t
	No	15.213	4.034	5	25		
CBRN-E Total	Yes	72.664	11.812	33	100	7.452	<0.001^t
	No	63.317	11.857	20	95		
CMS Pre-Crisis Activities	Yes	32.303	6.732	15	45	2.194	0.029^t
	No	30.733	6.763	9	45		

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale CMS: Crisis Management Scale Mean: Average SD: Standard deviation Min: Minimum Max: Maximum t: Independent samples t-test

Table 11 presents regression models in which the sub-dimensions of the CMS scale are taken as dependent variables and the dimensions of the CBRN-E incident preparedness perception scale are taken as independent variables. When examining the effect of the dimensions of the perception of preparedness for CBRN-E incidents on pre-crisis activities (CMS), all dimensions of the perception of preparedness for CBRN-E incidents have a significant effect on the pre-crisis activities dimension ($p < 0.05$). According to the results, a one-unit increase in the preparedness phase leads to a 0.305-unit increase in pre-crisis activities, a one-unit increase in the intervention phase leads to a 0.128-unit increase, and a one-unit increase in the post-disaster phase leads to a 0.263-unit increase. Additionally, the regression model obtained is statistically significant ($F = 28.148$; $p < 0.05$). According to the results, the independent variables (preparation phase, intervention phase, post-disaster phase) explain 15.2% of the dependent variable (pre-crisis activities) ($p < 0.05$).

When examining the effect of CBRN-E incident preparedness perception dimensions on crisis response activities (CRA), all CBRN-E incident preparedness perception dimensions have a significant effect on the crisis response activities dimension ($p < 0.05$). According to the results, a one-unit increase in the preparedness phase leads to a 0.143-unit increase in crisis response activities, a one-unit increase in the intervention phase leads to a 0.196-unit increase, and a one-unit increase in the post-disaster phase leads to a 0.313-unit increase. Furthermore, this regression model is statistically significant ($F = 20.844$; $p < 0.05$). According to the results, the independent variables (preparation phase, intervention phase, post-disaster phase) explain 11.7% of the dependent variable (crisis response activities) ($p < 0.05$).

When examining the effect of the dimensions of preparedness perception for CBRN-E incidents on post-crisis activities (PCA), all dimensions of preparedness perception for CBRN-E incidents have a significant effect on the post-crisis activities dimension ($p < 0.05$). According to the results, a one-unit increase in the preparedness phase leads to a 0.076-unit increase in post-crisis activities, a one-unit increase in the intervention phase leads to a 0.059-unit increase, and a one-unit increase in the post-disaster phase leads to a 0.139-unit increase. Furthermore, this regression model is statistically significant ($F = 16.317$; $p < 0.05$). According to the results, the independent variables (preparation phase, intervention phase, post-disaster phase) explain 9.4% of the dependent variable (post-crisis activities) ($p < 0.05$). The correlation graph between the scores of the CBRN-E incident preparedness perception scale and the crisis management scale dimensions is presented in Figure 2. Figure 2, drawn in the R Project program, shows that there is no meaningless relationship between

the scale scores. Red tones indicate a positive relationship. All correlations in the study show a positive relationship and are statistically significant.

Table 11. Regression Analysis Results of Healthcare Workers' Perceptions of Preparedness for CBRN-E Incidents on Crisis Management Levels

Dependent Variable	Independent Variable	Unstandardised Coefficient		Standardised Coefficient	t	p	95% Confidence		VIF
		B	SE	Beta			Lower Limit	Upper Limit	
CMS Pre-Crisis Activities	Constant	16.408	1.643		9.987	<0.001	13.179	19.636	
	CBRN-E Preparation Phase	0.305	0.059	0.228	5.162	<0.001	0.189	0.421	1.088
	CBRN-E Intervention Phase	0.128	0.049	0.141	2.610	0.009	0.032	0.224	1.617
	CBRN-E Post-Disaster Phase	0.263	0.094	0.155	2.782	0.006	0.077	0.448	1.720
R ² =0.152 F=28.148 P<0.001									
CMS During-Crisis Activities	Constant	19.571	1.950		10.038	<0.001	15.740	23.403	
	CBRN-E Preparation Phase	0.143	0.070	0.092	2.038	0.042	0.005	0.281	1.088
	CBRN-E Intervention Phase	0.196	0.058	0.185	3.365	0.001	0.081	0.310	1.617
	CBRN-E Post-Disaster Phase	0.313	0.112	0.159	2.792	0.005	0.093	0.533	1.720
R ² =0.117 F=20.844 P<0.001									
CMS Post-Crisis Activities	Constant	8.052	0.865		9.307	<0.001	6.352	9.753	
	CBRN-E Preparedness Phase	0.076	0.031	0.112	2.445	0.015	0.015	0.137	1.088
	CBRN-E Response Phase	0.059	0.026	0.127	2.281	0.023	0.008	0.110	1.617
	CBRN-E Post-Disaster Phase	0.139	0.050	0.161	2.802	0.005	0.042	0.237	1.720
R ² =0.094 F=16.317 p<0.001									

CBRN-E Preparedness Perception Scale: Chemical, Biological, Radiological, Nuclear and Explosive (CBRN-E) Preparedness Perception Scale, CMS Crisis Management Scale, t: Test statistic, p: Significance value SE: Standard error, B: Beta coefficient

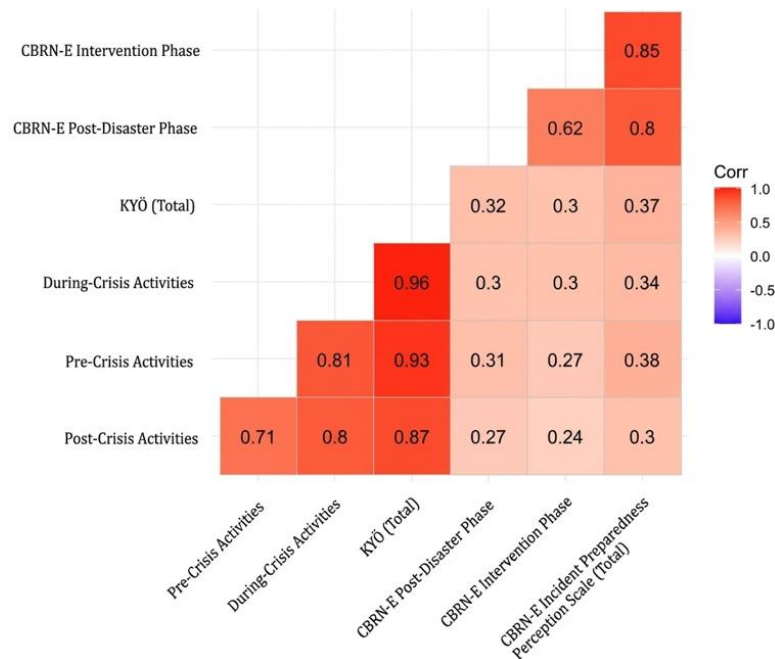


Figure 2. Correlations between Scores on the CBRN-E Incident Preparedness Perception Scale and Crisis Management Scale Dimensions

4. DISCUSSION

In our study, when looking at the participants' involvement in CBRN-E incidents, 8.0% (n=38) answered yes, while 92.0% (n=437) stated that they had not been involved before. In Dönmez's (2019) study with emergency medical personnel, 42.4% (n=185) of participants reported that they had never encountered a CBRN incident. In a study by Dallas et al. (2017), it was reported that 40% of emergency medical personnel had been assigned to radiological and nuclear incidents, while 66% were willing to take on a role in the event of an emergency. Cirit (2022) included not only hospital healthcare workers but also different occupational groups such as cleaning staff, security guards, and clinical support staff in his study. When asked, 'Have you been assigned by your institution in a CBRN incident?', 11 participants (5.65%) and 184 (94.35%) answered no. Polat (2024) conducted a study on pre-hospital healthcare personnel, in which 84.1% of participants stated that they had not been assigned to a CBRN-E incident, while 92.6% stated that they had not been exposed to any CBRN-E agent. It was determined that the personnel who answered 'no' to the research questions had been involved in the Covid-19 pandemic but had no knowledge of a CBRN-E incident caused by biological agents (Polat 2024). Assuming that the 186 participants in this study who answered that they had been working in the profession for 0-5 years did not work during the pandemic, it is thought that 289 people were working during the pandemic and that the majority of personnel lacked information about Covid-19 being a CBRN-E incident. In this context, it can be assumed that personnel lack education and knowledge regarding the identification of CBRN-E agents.

In this study, 25.1% of participants (n=119) stated that they had received CBRN-E training, while 74.9% (n=356) stated that they had not received such training. In Eren's (2023) study conducted on nurses at a university hospital, 44.1% (n=157) of the 356-person sample group stated that they had received training, while 55.9% (n=199) responded no. In Öner's (2020) study, 46.9% (n=113) of healthcare workers providing primary emergency healthcare services reported having previously received CBRN training, while 53.1% (n=128) reported not having received such training. Ayvazoğlu (2015) conducted a study on 410 participants, including students from two state hospitals and university health departments, and found that 175 (42.7%) had received CBRN training, while 235 (57.3%) had not. Additionally, of the 175 individuals who had received CBRN training, 125 (30.5%) stated that they had received CBRN training during their university education, while 39 (9.5%) stated that they had received CBRN training from other institutions. Kurt (2022) conducted a study on 444 family physicians, of whom 79 stated that they had received training, while 365 had not. In the study by Shah et al. (2021), regarding specific nuclear or radiological training, 86% of participants had never taken a course on nuclear emergency management, 11% had taken 1 course, 2% had taken 2-4 courses, and 1% had taken 5 courses. In the study by Dallas et al. (2017), out of a group of 418 participants consisting of emergency medical personnel, 56% had not taken a single course on radiological/nuclear content (n=234), approximately one-quarter had taken one course (n=108), 14.4% (n=60) had taken two to four courses, and only 3.3% (n=14) had taken five or more courses. In this study, the low rate of CBRN-E training completion may be attributed to the broad scope of the research and the participation of individuals from diverse professional backgrounds. Additionally, it is possible that employees have a low willingness to participate in voluntary training programs outside of school settings for CBRN-E education.

Continuous training and staff development are necessary in disaster preparedness plans and programmes (Walsh et al. 2015). Obstacles to disaster training include time constraints, very few or no staff allocated to training, and excessive workloads for individuals with the capacity to provide training. In this study, which used a face-to-face survey technique, the reasons cited by personnel for not wanting to receive CBRN-E training included the requirement for after-hours time and the perception that the training would be intensive and lengthy.

In this study, 159 (38.5%) respondents answered "yes" to the question "If you have not previously received CBRN-E training, would you like to receive CBRN-E training voluntarily?", while 254 (61.5%) respondents answered "no". In Eren's (2023) study, when asked, 'Would you like to receive training on CBRN?' 182 (51.1%) of the 199 nurses who had not received CBRN training answered yes, while 17 (4.8%) answered no. In

Gülkaya's (2022) study of emergency department staff, 53.6% (n=80) of participants responded that they wanted to improve themselves, while 18.5% (n=28) responded that they did not think they would encounter a significant CBRN threat case in the department where they worked. 28 people were aware of the importance of the issue but did not consider it a priority, while 17 people were not interested in the issue. 72.2% of participants (n=109) stated that they did not have sufficient knowledge and experience regarding CBRN threats, while 58.3% (n=88) stated that they would like to volunteer with search and rescue teams in the event of a CBRN disaster. Gyllencreutz et al. (2023) found that the majority (93%) of those who received training wanted to receive more training in their study of 11 physicians. A review of the literature suggests that participants are generally willing to participate in training programmes.

The study found a statistically significant, positive, and low-intensity difference between participants' ages and their CBRN-E response phase scores. In this context, it can be assumed that as individuals age, their experience increases and their capacity to respond to CBRN-E incidents also increases.

In this study, there is no statistically significant difference in the comparison of participants' perception of preparedness for CBRN-E incidents and crisis management dimensions according to gender. There is a statistically significant difference between the intervention phase scores on the CBRN-E incident preparedness perception scale ($p < 0.05$). When this difference is examined, women's intervention phase scores are significantly lower than men's. Azeem et al. (2019) found in their study with 200 healthcare workers at a tertiary hospital that men assessed themselves as more prepared for CBRN-E incidents. They believe that this situation is related to many underlying reasons such as gender roles and education (Azeem et al. 2019). Lemyre et al. (2007) conducted a study with 1,502 members of the public and found that women perceived different CBRN-E scenarios as having serious consequences and a greater impact on their lives, while men believed they would be better able to cope with CBRN-E attacks. It can be assumed that men are more willing to take an active role in response efforts. The gender differences in preparedness observed in the literature and in this study may be related to social and cultural values and the assumption of responsibility. Furthermore, when the results are examined, the general situation in Turkey in terms of gender can also be taken into consideration when evaluating why male employees exhibited assertive behavior during the intervention process. It can be interpreted that the results of the study may reflect an aspect of how gender roles are reflected in the social process.

In this study, there is a significant difference in the scores of participants on the CBRN-E incident preparedness perception scale and crisis management scale dimensions according to their level of education in the crisis response activities dimension. When we examine this difference, we see that high school and associate degree graduates have higher scores on crisis response activities than postgraduate degree graduates. In Tazearslan's (2021) study, it was found that associate degree graduates had higher average preparedness scores for CBRN incidents than bachelor's degree graduates. (Ayvazoglu, 2015) conducted a study with healthcare workers and students to determine the level of CBRN preparedness and volunteerism. The study found that associate degree graduates and students had higher risk and protective equipment usage than bachelor's and master's degree graduates and students, and that there was a statistically significant difference between them. Kaynar (2023) found in his study of workers providing pre-hospital emergency health services that as the level of education increased, the anxiety and stress levels of personnel encountering CBRN incidents increased, and cooperation with other units (AFAD, UMKE, police, fire department) increased. In this study and in the findings in the literature, the target audience is different, so there may be differences in the level of knowledge about CBRN-E and in understanding and perceiving CBRN-E incidents, and the level of education may have an effect on understanding the seriousness of CBRN-E incidents. In this context, it highlights the importance of continuous CBRN-E training and regular education and drills on threats and hazards. It can be argued that the reason why the group with a lower level of education behaves more aggressively in intervention activities compared to the group with a higher level of education is that the former has a higher level of awareness regarding the dangers of intervention processes in CBRN incidents. In this case, it can be said that the latter group exhibits a more passive and cautious approach.

In this study, there is a statistically significant difference between the scores of participants in different occupational groups on the CBRN-E incident preparedness perception (total) scale ($p < 0.05$). When these differences are examined, the scores of participants in the midwife-nurse occupational group on the CBRN-E incident preparedness perception (total) scale are significantly higher than those of individuals in other occupational groups. In his study with emergency medical personnel, Dönmez (2019) found that emergency medicine specialists' interest in CBRN incidents, their perception of their seriousness, and their willingness to improve themselves were significantly higher than those of other titles (emergency medicine assistant, nurse, paramedic, emergency medicine technician). In their study, Becker and Middleton (2008) stated that doctors and nurses' perceptions of preparedness deficiencies in radiological terrorist incidents generally indicate that they may be vulnerable in unfamiliar situations, concerns about the hospital's inadequate response capacity, lack of information on radiological agents, inadequate PPE, and that current training is minimal compared to chemical and biological incidents. The different results obtained in this study and in the literature can be interpreted as being due to the selection of different professional groups and target audiences participating in the study. In this study, there is a statistically significant difference ($p < 0.05$) between the scores of participants in the CMS pre-crisis activities and CMS dimensions according to their years of professional experience. When these differences are examined, the scores of individuals with 6-10 years of work experience in the profession on the CM pre-crisis activities and CM (Crisis Management Scale) dimensions are significantly lower than those of employees with 21 years or more of work experience. This situation can be explained by the professional experience of the staff and the fact that those who have worked in the profession for longer periods have had more opportunities to receive training in the relevant field.

This study found that individuals who had previously been involved in CBRN-E incidents had significantly higher scores on the CBRN-E incident preparedness perception scale and its sub-dimensions than individuals who had not been involved in such incidents. Aslantaş (2019) conducted a study with personnel working at 112 emergency health service stations and found that there was a statistically significant difference ($p < 0.05$) between the averages of those who had been involved in disasters and/or extraordinary situations and those who had not. It can be assumed that the knowledge and experience gained from participating in CBRN-E incidents in the past may enable individuals to anticipate preparedness and crisis signals in advance. In this case, it shows that they are more cautious in recognizing potential dangers in related incidents, identifying risks, and classifying them. Awareness and risk management skills gained through experience can be perceived as leading them to approach CBRN incidents by thoroughly considering secondary risks and showing a tendency to eliminate the potential risks of their interventions.

In this study, participants who had previously received training on CBRN-E incidents scored significantly higher than those who had not received training on all dimensions of the CBRN-E incident preparedness perception scale and on the pre-crisis activities dimension. In Kızılkaya's (2020) study on students in the Emergency Aid and Disaster Management (AYAY) department, students who received CBRN training had significantly higher preparedness perceptions than those who did not. Şen and Ersoy (2017) found that hospital disaster teams who received CBRN training had a higher level of knowledge about disaster preparedness. In this context, it can be assumed that training received prior to encountering CBRN-E incidents has a positive relationship with individuals' preparedness and crisis management activities.

Table 11, which shows the effects of independent variables on the dependent variable in the regression analysis, indicates that all sub-dimensions of the independent variable CBRN-E preparedness perception scale have a significant effect on all sub-dimensions of the dependent variable crisis management scale. Furthermore, all regression models provided are statistically significant. The effective management of intervention processes, the mitigation of potential risks related to intervention, the effective management of the communication chain, the proper implementation of interventions targeting the contamination process, and the effective execution of triage procedures are of great importance. In this context, all preparedness activities carried out before encountering CBRN-E incidents show that there is a positive relationship with the crisis management skills of the participants. Individuals who are effectively prepared

for CBRN-E incidents and play a role in preparedness activities are knowledgeable about participating in training and exercises, units that will provide support, triage and first response issues, the use of PPE, patient/casualty care, awareness of their roles, etc. It is thought that they can influence crisis management, knowing the crisis team and their roles and responsibilities, knowing and understanding crisis scenarios, taking precautions against crises, knowing the chain of communication, knowing the incident/case reporting mechanism during a crisis, using the knowledge and skills acquired from the training they have received, etc. The study clearly demonstrates that preparedness for CBRN incidents in the health sector and the crisis management skills of personnel working in the field are important in process management. It can be predicted that low awareness of CBRN incidents, lack of training and experience may lead to secondary risks in crisis management from the moment the crisis begins, disrupting the management process and triggering widespread disaster risks depending on the situation. From this perspective, it is evident that healthcare workers at all levels who may be directly exposed in this field require qualified and practical training in this context.

5. CONCLUSION

CBRN-E incidents have irreparable effects on people and society. CBRN-E agents are considered a threat that healthcare institutions must be prepared for (Kenar and Karayılanoğlu 2004). The healthcare system must prepare for these incidents by taking the necessary precautions in advance and offering solutions based on lessons learned after the incident. Hospitals must involve all staff in preparedness efforts against the transport and spread of all types of CBRN-E agents, particularly biological agents such as hospital infections. When CBRN-E incidents occur, hospital staff, particularly healthcare professionals who work around the clock, should be evaluated as a whole, and all staff should be included in training, drills, and preparedness efforts.

CBRN-E incidents are events that cause mass casualties, illness or loss of life and require emergency response. As a result of literature research, the focus has been on medical, nursing, paramedic/ATT, and emergency service personnel among the first responders. It is recommended that all health care personnel who will be working together in these disasters be included in future studies on preparedness for CBRN-E incidents (Gowing et al. 2017).

Pakdemirli (2021) stated in his study that healthcare workers are exposed to many chemical and biological hazards and risks in hospitals. These risks may be considered to apply not only to healthcare personnel who are in close contact with patients, but also to many other people in the hospital, from cleaning staff to medical secretaries, security guards to hospital administrators. It is recommended that all hospital staff be considered as a whole and that basic CBRN-E training be provided to staff working in departments other than emergency rooms, intensive care units, and operating rooms, where priority equipment is required, in order to increase their level of knowledge.

Eyison et al. (2020) argued that there are serious deficiencies in CBRN training in hospitals and that CBRN training should be provided to healthcare personnel in the field, particularly at reference CBRN hospitals in each province. This study recommends that, in addition to healthcare personnel, other hospital staff (security guards, cleaning staff, technical support personnel, etc.) should also participate in CBRN-E training and acquire basic knowledge. Since all hospital staff at every level are highly likely to encounter a CBRN incident, providing this training to all staff is crucial for the effective management of processes. The Covid-19 pandemic can be cited as an example in this regard, as all hospital staff have been directly exposed to related cases. From this perspective, there is a high need for training at a level that enables staff to understand what CBRN incidents are and to identify cases where they may have been exposed to a CBRN incident.

Hospitals must develop effective plans for disasters and CBRN-E incidents requiring special attention. Plans must serve their purpose, be kept up to date, be consistent with local and national plans, ensure the active participation of managers, establish a command-control and communication chain, include transportation

and infrastructure plans, define roles and responsibilities, and be updated with information gained from drills (Sezigen 2009).

In his study targeting university students studying in the field of health, Karakoç (2024) emphasises the importance of university education in ensuring that personnel who will be tasked with responding to CBRN-E threats and hazards have the necessary knowledge and equipment. In this context, it can be considered that healthcare personnel receiving CBRN-E training from the university stage onwards will increase their preparedness for future threats and hazards and play a more effective role in crisis management. It is becoming increasingly clear that professionals working in the healthcare sector require training that equips them with the ability to identify CBRN incidents, manage the process, manage decontamination procedures, and recognize and use personal protective equipment.

Altan et al. (2022) argued that, in addition to the benefits of physical applications in CBRN-E training, virtual reality and computer games should be developed as alternatives due to the time-consuming and costly nature of training programmes, emphasising the importance of simulations in enabling users to learn in a controlled and safe manner. In addition to training and drills, it is thought that simulation and gamification may have a positive relationship with individuals' preparedness perceptions and crisis management processes in preparation for CBRN-E incidents. It can be said that it is important for healthcare professionals to utilize current technology and prepare for various scenarios involving CBRN incidents through interactive training content developed specifically for such events in the virtual world, thereby contributing to the management of a healthy management process in relevant cases.

This study emphasises the need for hospitals to respond as a whole and prepare as a team in CBRN-E incidents by including hospital staff other than healthcare professionals. Based on the understanding that the strength of a team is only as strong as its weakest link, it is recommended that all employees, especially healthcare personnel, be included in training and drills for CBRN-E incidents that require special diagnosis, treatment, care, and hygiene, and that training be conducted on a routine basis. The aim should be to increase motivation by following alternative training methods in line with developing technology for CBRN-E training.

The training content should be prepared and developed with consideration given to the educational level, title, professional knowledge, unit of employment, etc. of those participating in CBRN-E training.

As an alternative to the face-to-face survey technique used in this study, it is recommended that online data collection tools be used to reach a wider audience. Considering the time and space constraints of the research, the study could be continued as a step towards direct field application, with a focus on expanding the research to the general public and determining the level of knowledge of health professionals working in the field of CBRN-E, thereby emphasizing efforts related to educational content planning.

Etik Beyan / Ethical Statement

Yazarlar, bu çalışmanın tüm aşamalarında akademik ve etik kurallara uyulduğunu ve yararlanılan tüm kaynaklara usulüne uygun şekilde atıf yapıldığını beyan ederler. / The authors declare that academic and ethical guidelines were followed throughout all stages of this study and that all sources used were properly cited.

Etik Kurul Onayı / Ethical Approval

Araştırmanın yürütülebilmesi için Tekirdağ Namık Kemal Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu'ndan 28/03/2023 tarihli ve 2023.50.03.09 sayılı karar ile etik kurul onayı alınmıştır. / To conduct the research, ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Tekirdağ Namık Kemal University on 28/03/2023 with approval number 2023.50.03.09.

Çıkar Çatışması / Conflict of Interest

Yazarlar, bu çalışmada bildirilen sonuçları etkileyebilecek bilinen herhangi bir finansal çıkar çatışması veya kişisel ilişki bulunmadığını beyan ederler. / The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Yazar Katkıları / Author Contributions

1. Yazar: Kavramsallaştırma, Metodoloji, Yazılım, Araştırma, Biçimsel Analiz, Veri Temini, Yazım - Orijinal Taslak, Görselleştirme.
2. Yazar: Danışmanlık/Süpervizyon, Metodoloji, Doğrulama, Kaynaklar, Yazım - İnceleme ve Düzenleme, Proje Yönetimi.
- 1.Author: Conceptualization, Methodology, Software, Investigation, Formal Analysis, Data Curation, Writing - Original Draft, Visualization.
- 2.Author: Supervision, Methodology, Validation, Resources, Writing – Review & Editing, Project Administration.

Yapay Zekâ Beyanı / AI Declaration

Yazarlar, bu makalenin hazırlanmasında üretken yapay zekâ veya yapay zekâ destekli araçların kullanılmadığını ve tüm içeriğin akademik dürüstlük ilkeleri doğrultusunda yazarlar tarafından üretildiğini beyan ederler. / The authors declare that no generative AI or AI-assisted tools were used in the preparation of this manuscript and all content was produced by the authors in accordance with academic integrity.

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