Evaluation of disaster medicine knowledge levels and e-learning attitudes among prehospital healthcare personnel: A case study of Istanbul

Hastane öncesi sağlık personelinin afet tıbbı bilgi düzeyi ve e-öğrenme tutumlarının değerlendirilmesi: İstanbul örneği

Ahmet Dogan Kuday[1], Tugba Ozcan[2], Kerem Kinik[3], Cuneyt Caliskan[3]

[1] Department of First and Emergency Aid, Vocational School of Health Services, Bezmialem Vakıf University

[2] Department of First and Emergency Aid, Hamidiye Vocational School of Health Services, Bezmialem Vakıf University

[3] Department of Emergency Aid and Disaster Management, Hamidiye Faculty of Health Sciences, University of Health Sciences

Abstract

Aim: The aim of this study is to evaluate the disaster medicine knowledge level of prehospital healthcare personnel, identify their educational expectations, and determine their attitudes toward e-learning.

Methods: This cross-sectional study was conducted between February 1 and March 31, 2023. The population of the study consisted of 3817 personnel working in the Istanbul Provincial Ambulance Service, and the sample consisted of 384 personnel. Participants were administered a survey including the Personal Information Form, the Attitude Towards E-learning Scale, and the Disaster Medicine Knowledge questionnaire through face-to-face data collection method.

Results: Of the 384 participants, 119 were Emergency Medical Technicians (EMTs), 241 were paramedics, and 24 were physicians. The average disaster medicine knowledge level was 68.15±14.06, and the average attitude towards e-learning level was 26.69±8.42. Of the participants, 52.1% (n=200) had a low level of disaster medicine knowledge, while 47.9% (n=184) had a high level of knowledge. The majority of participants (n=221, 64.8%) preferred to receive disaster medicine training online. Participants who expressed a desire for disaster medicine training had higher attitudes toward e-learning compared to those who did not (28.43±7.93 vs. 23.74 ± 8.39; p < 0.001).

Conclusion: This study found that the majority of prehospital healthcare personnel had low levels of disaster medicine knowledge, but high attitudes towards e-learning. Developing an online training program tailored to current developments and needs in disaster medicine could systematically prepare prehospital healthcare personnel for their disaster response roles. Making this training a mandatory part of in-service education could enhance the knowledge levels and confidence in personal competence of personnel with lower knowledge levels.

Keywords: Disaster medicine; education; emergency medicine; learning; paramedics

Öz

Amaç: Bu çalışmanın amacı, hastane öncesi sağlık personelinin afet tıbbı bilgi düzeyini değerlendirmek, eğitim beklentilerini belirlemek ve e-öğrenmeye yönelik tutumlarını saptamaktır.

Yöntemler: Bu kesitsel çalışma 1 Şubat ve 31 Mart 2023 tarihleri arasında gerçekleştirilmiştir. Çalışmanın evrenini İstanbul İl Ambulans Servisi'nde çalışan 3817 personel, örneklemini ise 384 personel oluşturmuştur. Katılımcılara yüz yüze veri toplama yöntemi ile Kişisel Bilgi Formu, E-öğrenmeye Yönelik Tutum Ölçeği ve Afet Tıbbı Bilgi Anketi uygulanmıştır.

Bulgular: 384 katılımcının 119'u acil tıp teknisyeni, 241'i paramedik ve 24'ü doktordu. Afet tıbbı bilgi düzeyi ortalaması 68.15±14.06, e-öğrenmeye yönelik tutum düzeyi ortalaması 26.69±8.42 olarak bulundu. Katılımcıların %52,1'i (n=200) düşük düzeyde afet tıbbı bilgisine sahipken, %47,9'u (n=184) yüksek düzeyde bilgiye sahiptir. Katılımcıların çoğunluğu (n=221, %64.8) afet tıbbı eğitimini çevrimiçi olarak almayı tercih etmiştir. Afet tıbbı eğitimi talep eden katılımcılar, talep etmeyenlere kıyasla e-öğrenmeye yönelik daha yüksek tutum sergilemiştir (28.43±7.93 vs. 23.74±8.39; p < 0.001).

Sonuç: Bu çalışma, hastane öncesi sağlık personelinin çoğunluğunun düşük afet tıbbı bilgi düzeyine sahip olduğunu, ancak e-öğrenmeye yönelik yüksek tutum sergilediğini göstermiştir. Afet tıbbındaki güncel gelişmelere ve ihtiyaçlara göre tasarlanmış bir çevrimiçi eğitim programının geliştirilmesi, hastane öncesi sağlık personelini afet müdahale rollerine sistematik bir şekilde hazırlayabilir. Bu eğitimin hizmet içi eğitimin zorunlu bir parçası haline getirilmesi, bilgi düzeyi düşük olan personelin bilgi düzeylerini ve kişisel yeterliliklerine olan güvenlerini artırabilir.

Anahtar Sözcükler: Acil tıp; afet tıbbı; eğitim; öğrenme; sağlık görevlileri

Received/*Geliş* : 14.06.2024
Accepted/*Kabul*: 29.07.2024

DOI: 10.21673/anadoluklin.1501179

Corresponding author/*Yazışma yazarı*

Ahmet Doğan Kuday

Bezmialem Vakıf Üniversitesi, Sağlık Hizmetleri Meslek Yüksekokulu, İlk ve Acil Yardım Programı, İstanbul, Türkiye.
E-mail: dogankuday@gmail.com

ORCID

Ahmet D. Kuday: 0000-0001-8361-5526
Tuğba Özcan: 0000-0003-4062-892X
Kerem Kınık: 0000-0002-6913-5312
Cüneyt Çalışkan: 0000-0003-0232-1118

INTRODUCTION

Disasters are events that can be natural, human-induced, or a combination of both, disrupting the normal functioning of society and causing numerous economic and physical losses that are difficult to manage with local resources (1). To effectively manage these events, a comprehensive understanding of disaster medicine is essential. Disaster medicine is a rapidly evolving field, where prehospital healthcare personnel play a pivotal role (2). These personnel must be adequately prepared to respond and deliver medical care to disaster victims. However, the level of disaster medicine knowledge among prehospital healthcare personnel can vary significantly depending on their education and experience. While some may have received extensive education and participated in numerous disaster drills, others might have limited training and experience in this area (3). This lack of education and experience can lead to challenges that complicate medical interventions, thereby significantly impacting the overall quality of care provided to disaster victims (4). Therefore, it is crucial for prehospital healthcare personnel to possess the necessary knowledge and skills to respond effectively to disasters (5). Although the World Medical Association (WMA) and the World Association for Disaster and Emergency Medicine (WADEM) have advocated for the inclusion of disaster medicine in medical education curricula, current educational programs often lack a comprehensive curriculum and standardization (6,7).

E-learning presents a practical solution for overcoming challenges in disaster medicine education, offering numerous significant advantages (8-10). One major benefit of e-learning is that it allows prehospital healthcare personnel to learn at their own pace and in a convenient location. Additionally, e-learning can result in significant cost savings compared to traditional training programs, as it eliminates the need for physical classrooms and instructors (11). This is particularly crucial for prehospital healthcare personnel working in remote areas who may not have access to conventional educational programs. Moreover, e-learning platforms offer a variety of resources such as videos, simulations, and interactive modules that help prehospital healthcare personnel understand complex concepts and gain practical experience in a safe environment (12). Another advantage of e-learning is its potential to standardize training programs. E-learning platforms can deliver a uniform and comprehensive curriculum that is continuously updated to reflect the latest research findings and best practices. This ensures that prehospital healthcare personnel have access to up-to-date and accurate information, enabling them to acquire the necessary knowledge and skills to respond effectively to disasters.

Improving the knowledge and skills of pre-hospital healthcare personnel and standardizing disaster medicine training programs are vital for effective disaster response. Indeed, insufficient disaster medicine knowledge among these healthcare personnel can complicate the provision of health services during disasters. Therefore, in-service training should be conducted to reduce the vulnerabilities of this personnel to emergencies and disasters and to enhance their personal preparedness (13-15). However, the findings indicate that there are limited studies in the literature assessing the level of disaster medicine knowledge in some provinces, and none that analyze it in conjunction with attitudes toward e-learning. Specifically, there is no research focusing on Istanbul. Therefore, the objective of this study is to assess the disaster medicine knowledge levels of prehospital healthcare personnel in Istanbul and to determine their expectations and attitudes towards e-learning-based training. The findings of this study are hoped to contribute to the development of strategies to enhance the effectiveness of disaster medicine training and represent a significant step towards improving the preparedness of healthcare personnel in Istanbul for disasters.

MATERIAL AND METHODS

Study design and participants

This cross-sectional study was conducted between February 1 and March 31, 2023. The study population comprised 3817 personnel, including emergency medical technicians (EMTs), paramedics, and physicians employed at the Istanbul Provincial Ambulance Service. A simple random sampling method was used to select the study sample. The minimum required sample size was calculated to be 349 using the known population sample calculation formula (16). To ac-

count for potential data loss, the final sample size was increased by 10%, resulting in a total of 384 personnel included in the study. The inclusion criteria were as follows: working in Istanbul, working as a physician, EMT, or paramedic, and volunteering to participate in the study. Individuals who did not meet the inclusion criteria and those who did not agree to participate voluntarily were excluded from the study.

Data collection

A survey consisting of three parts was administered to the participants through a face-to-face survey method. The informed consent form, which included information about the aim of the study, the importance of answering the questions sincerely and honestly, and assurances that their responses would be kept confidential, was provided to the participants in person. Additionally, participants were informed that they had the autonomy to discontinue their participation in the study at any given moment. After reading the informed consent form, the participants were invited to participate in the research verbally and in writing confirming their agreement to partake in the study. Those who agreed to the informed consent form then filled in the survey provided by the researchers in a face-to-face setting. The completion of the survey took approximately 25 minutes, depending on the speed at which the participants answered the questions. Participants were able to ask questions and seek clarification from the researchers during the process, ensuring a thorough understanding of the study's requirements.

Measurement tools

The first section of the survey included questions related to personal information. These questions covered age, gender, education level, unit of employment, length of service, previous disaster medicine education, interest in receiving disaster medicine education, and preferred method for receiving disaster medicine education.

The second section comprised 25 multiple-choice questions designed to assess the knowledge level of disaster medicine. Since there is no valid and reliable measurement tool developed to evaluate disaster medicine knowledge level in the literature, the disaster medicine questions were created by the researchers based on previous studies and the Didactic Course of the European Master Program in Disaster Medicine (17-22). In our study, 25 multiple-choice questions were prepared to assess the level of knowledge in the field of disaster medicine. Each question includes four answer options, and the correct answer is worth 4 points. Using this system, the total score is calculated out of 100 points. The reason for using a 100-point scale is to facilitate calculations and clearly express the results. In the literature, similar studies have established a cut-off point or median value of 70 points (3,18). In this study, a cut-off point of 70 points was also used to classify participants' knowledge levels as sufficient (70 and above) or insufficient (below 70). The purpose of selecting this cut-off point is to ensure consistency with the literature and to facilitate comparative analyses.

The third section contained 9 questions evaluating attitudes toward e-learning. The Attitude Towards E-learning Scale (ATELS) was developed by Zabadi and Al-Alawi (2016) and adapted into Turkish by Aydın, Şahin & Kulakaç in 2022 (23,24). The scale consists of 11 items on a 5-point Likert scale ranging from "strongly agree-5" to "strongly disagree-1". The 9th item is reverse-scored, while the others are scored positively. The scores obtained from the scale range between 9 and 45, with higher scores indicating a more positive attitude towards e-learning. The Turkish validation and reliability study of ATELS determined the Cronbach's alpha reliability coefficient to be 0.913.

Statistical analyses

Statistical analyses was performed using SPSS version 25 (IBM Corp, Armonk, NY). The normality of the variables was assessed using the Kolmogorov-Smirnov test. Categorical data were presented as frequencies and percentages, while continuous data were expressed as means and standard deviations. An independent samples t-test was employed to compare differences between two groups, and Analysis of Variance (ANOVA) was used to compare differences among three or more groups. To identify which groups were responsible for significant differences, the LSD posthoc test was applied. The level of statistical significance was set at $p < 0.05$.

Ethical consideration

The study was approved by the Ethics Committee of the University of Health Sciences (date: 28.12.2022, decision no: 14371). Additionally, permission to conduct the study was obtained from the Istanbul Provincial Directorate of Health with reference number E-15916306-604.01.01.01 on February 15, 2023. Participants were informed about the aim and content of the study, and written informed consent was obtained from all participants prior to their involvement in the study.

RESULTS

Demographic information of prehospital healthcare personnel

Among the participants, the majority were paramedics (62.8%), followed by EMTs (31%) and physicians (6.2%). The age distribution revealed that the largest age group was 26-31 years old (37.8%). Gender distribution was relatively balanced, with a slightly higher percentage of males (57.3%). Most participants were employed in emergency medical service stations, with notable differences in the length of service; 39.5% of EMTs had over 16 years of service, whereas only 9.6% of paramedics and 4.2% of physicians had similar tenure. A significant proportion (44.5%) of the participants had received disaster medicine education previously, with university education being the most common source (42.1%). The majority expressed a preference for receiving disaster medicine education through online courses (68.1%).

Interest in further disaster medicine education is notably high, with 89.9% of EMTs, 88.4% of paramedics, and 87.5% of physicians expressing interest. The preferred method for receiving this education is predominantly online courses, favored by 65.4% of EMTs, 68.1% of paramedics, and 71.4% of physicians (Table 1). Regarding preferred topics for disaster medicine education, "search and rescue" emerged as the most commonly preferred topic (86%), whereas "disaster research and epidemiology" was the least preferred topic (39%), as illustrated in Figure 1.

Disaster medicine knowledge level of prehospital healthcare personnel

Table 2 presents the questions used to evaluate the disaster medicine knowledge level and the details of the answers provided by prehospital healthcare personnel. None of the participants answered all the questions correctly, and no single question was answered correctly by all participants. The question with the highest number of correct answers was Q9, which addressed infectious diseases, correctly answered by 93% (n=337) of the participants. In contrast, Q22, concerning the Simple Triage and Rapid Treatment (START) system, received the lowest number of correct answers, with only 32.3% (n=124) of participants answering correctly. Q9, Q11, Q12, Q13, Q21, Q23, and Q25 were answered correctly by all physicians. The most frequently incorrectly answered question varied by professional role: EMTs struggled most with Q15 (communication and command), paramedics with Q3 (terrorism attack), and physicians with Q17 (legal legislation).

The mean disaster medicine knowledge score was 66.05 ± 13.53 (ranging from 36.00 to 92.00) for EMTs, 71.13 ± 12.61 (ranging from 24.00 to 92.00) for paramedics, and 67.00 ± 8.84 (ranging from 56.00 to 84.00) for physicians. Among all participants, 200 (52.1%) had a low level of disaster medicine knowledge, while 184 (47.9%) had a high level of disaster medicine knowledge. Regarding occupational groups, 37.8% (n=45) of the EMTs, 55.2% (n=133) of the paramedics, and 25% (n=6) of the physicians were found to have a high level of disaster medicine knowledge.

There was a significant relationship between disaster medicine knowledge level and several factors ($p < 0.05$). Firstly, participants aged 31 and over scored higher than those aged 20-25 (71.81 ± 11.36 vs. 67.10 ± 14.87; $p = 0.011$). Secondly, individuals with associate degrees (69.29 ± 12.51), bachelor's degrees (70.41 ± 10.20), and postgraduate degrees (75.65 ± 18.91) scored higher than high school graduates (56.52 ± 15.78; $p < 0.001$). Additionally, those working in Emergency Medical Service Stations (71.82 ± 12.35) scored higher than those in Patient Transport Units (66.66 ± 11.18) and Administrative Units (63.55 ± 15.64; $p < 0.001$). Regarding years of experience, participants with 6-10 years of experience scored higher than those with less than a year of experience (71.09 ± 12.92 vs. 61.76 ± 14.60; $p < 0.001$), and those with 11-15 years of experience scored higher than both those with less than a year and those with 1-5 years of experience (74.61 ± 8.89 vs. 68.00 ± 12.80; $p < 0.001$). Paramedics scored

Table 1. Demographic information of participants

Variables	EMTs (n=119)	Paramedics (n=241)	Physicians (n=24)	p
Age				
20 – 25	29 (24.4)	96 (39.8)	4 (16.7)	
26 – 31	21 (17.6)	110 (45.7)	14 (58.3)	***<0.001*** **
> 31	69 (58.0)	35 (14.5)	6 (25.0)	
Gender				
Male	62 (52.1)	140 (58.1)	18 (75.0)	0.108*
Female	57 (47.9)	101 (41.9)	6 (25.0)	
Education level				
High school degree	23 (19.3)	0	0	
Associate degree	53 (44.5)	151 (62.7)	0	***<0.001*** **
Bachelor's degree	38 (31.9)	75 (31.1)	21 (87.5)	
Postgraduate degree	5 (4.2)	15 (6.2)	3 (12.5)	
Unit of employment				
Emergency medical service station	57 (47.9)	132 (54.8)	11 (45.8)	
Emergency call center	32 (26.9)	60 (24.9)	11 (45.8)	0.205**
Patient transport unit	15 (12.6)	28 (11.6)	2 (8.3)	
Administrative unit	15 (12.6)	21 (8.7)	0	
Length of service				
< 1 year	7 (5.9)	15 (6.2)	3 (12.4)	
1 – 5 years	27 (22.7)	121 (50.2)	7 (29.2)	
6 – 10 years	18 (15.1)	53 (22.0)	13 (54.2)	***<0.001*** **
11 – 15 years	20 (16.8)	29 (12.0)	0	
≥ 16 years	47 (39.5)	23 (9.6)	1 (4.2)	
Have you ever received disaster medicine education before?				
Yes	42 (35.3)	120 (49.8)	9 (37.5)	***0.026****
No	77 (64.7)	121 (50.2)	15 (62.5)	
If so, where did you receive disaster medicine education?				
University education	14 (33.3)	55 (45.8)	3 (33.3)	
NGOs	12 (28.6)	36 (30.0)	2 (22.2)	0.363**
Online course	3 (7.1)	11 (9.2)	1 (11.1)	
In-service training	13 (31.0)	18 (15.0)	3 (33.3)	
Do you want to receive disaster medicine education?				
Yes	107 (89.9)	213 (88.4)	21 (87.5)	0.890*
No	12 (10.1)	28 (11.6)	3 (12.5)	
How would you like to receive disaster medicine education?				
Traditional classroom	37 (34.6)	68 (31.9)	6 (28.6)	0.823*
Online courses	70 (65.4)	145 (68.1)	15 (71.4)	

EMT: Emergency Medical Technician, NGOs: Non-governmental Organizations, n: Number, %: Percentage

* Independent t-test, ** One-way ANOVA.

Table 2. Comparison of disaster medicine knowledge questions by professional role

No	Questions	EMT (n, %)	Paramedic (n, %)	Physician (n, %)	Total (n, %)
1	Crush syndrome	89 (74.8)	208 (86.3)	21 (87.5)	318 (82.8)
2	First aid	95 (79.8)	190 (78.8)	15 (62.5)	300 (78.1)
3	Terrorism attack	39 (32.8)	88 (36.5)	9 (37.5)	136 (35.4)
4	Cardiopulmonary resuscitation	55 (46.2)	157 (65.1)	15 (62.5)	227 (59.1)
5	Chemical disaster response	56 (47.1)	130 (53.9)	15 (62.5)	201 (52.3)
6	Chemical emergency response	103 (86.6)	190 (78.8)	12 (50.0)	305 (79.4)
7	Personal protective equipment	87 (73.1)	188 (78.0)	15 (62.5)	290 (75.5)
8	Radiological disaster response	57 (47.9)	135 (56.0)	9 (37.5)	201 (52.3)
9	Infectious diseases	111 (93.3)	222 (92.1)	24 (100.0)	357 (93.0)
10	Infection management	89 (74.8)	215 (89.2)	18 (75.0)	32 (83.9)
11	Psychological support	104 (87.4)	219 (90.9)	24 (100.0)	347 (90.4)
12	Public health preparedness	102 (85.7)	210 (87.1)	24 (100.0)	336 (87.5)
13	Risk management	108 (90.8)	219 (90.9)	24 (100.0)	351 (91.4)
14	Disaster management	64 (53.8)	158 (65.6)	15 (62.5)	237 (61.7)
15	Communication and command	17 (14.3)	100 (41.5)	9 (37.5)	126 (32.8)
16	Medical aid organizations	66 (55.5)	135 (56.0)	15 (62.5)	216 (56.3)
17	Legal legislation	58 (48.7)	124 (51.5)	6 (25.0)	188 (49.0)
18	Disaster preparedness	100 (84.0)	199 (82.6)	9 (37.5)	308 (80.2)
19	Incident command system	101 (84.9)	158 (65.6)	18 (75.0)	277 (72.1)
20	Incident command management	55 (46.2)	152 (63.1)	15 (62.5)	222 (57.8)
21	Logistic management	96 (80.7)	197 (81.7)	24 (100.0)	317 (82.6)
22	START triage	22 (18.5)	93 (38.6)	9 (37.5)	124 (32.3)
23	Triage coding	110 (92.4)	196 (81.3)	24 (100.0)	330 (85.9)
24	Travma patient management	87 (73.1)	196 (81.3)	9 (37.5)	292 (76.0)
25	Media and public relations	94 (79.0)	207 (85.9)	24 (100.0)	325 (84.6)

EMT: Emergency Medical Technician, START: Simple Triage and Rapid Treatment, n: Number, %: Percentage

higher than EMTs (71.13 ± 12.61 vs. 66.05 ± 13.53; $p < 0.001$). Lastly, prehospital healthcare personnel who had previously received disaster medicine education scored higher than those who had not received such education (71.39 ± 14.29 vs. 67.62 ± 11.44; $p = 0.005$).

Attitudes toward E-learning of prehospital healthcare personnel

The Attitude Toward E-learning scores were 28.57 ± 8.05 for EMTs, 27.43 ± 7.96 for paramedics, and 29.41 ± 9.69 for physicians (Table 3). A significant relationship was found between Attitudes Toward E-learning and educational level, length of service, and desire for disaster medicine education. High school graduates had significantly higher scores (35.47 ± 6.08) compared to associate degree holders (27.25 ± 7.93), bachelor's degree holders (27.41 ± 7.79), and postgraduate degree holders (29.08 ± 9.64) ($p < 0.001$). Those with less than one year of service had higher scores (34.20 ± 5.62) than those with 1-5 years (27.02 ± 8.77), 6-10 years (29.21 ± 8.60), and 11-15 years (26.06 ± 7.14) ($p < 0.001$). Personnel wishing to receive disaster medicine education scored higher (28.43 ± 7.93) than those who did not (23.74 ± 8.39; $p < 0.001$). Lastly, those preferring online courses had higher scores (29.27 ± 8.04) compared to those preferring traditional classroom education (26.71 ± 7.44; $p < 0.001$).

Table 3. Comparison of attitudes toward e-learning and disaster medicine knowledge levels of participants

Variables	DMKL		ATEL	
	Mean ± SD	p	Mean ± SD	p
Age				
20 – 25 years old	67.10 ± 14.87		28.37 ± 8.61	
26 – 31 years old	68.91 ± 11.84	***0.011***[b]	28.85 ± 8.28	0.060[b]
> 31 years old	71.81 ± 11.36		26.58 ± 7.29	
Gender				
Male	68.56 ± 13.46	0.195[a]	27.44 ± 8.15	0.190[a]
Female	70.29 ± 12.09		28.54 ± 8.03	
Education level				
High school degree	56.52 ± 15.78		35.47 ± 6.08	
Associate degree	69.29 ± 12.51	***<0.001***[b]	27.25 ± 7.93	***<0.001***[b]
Bachelor's degree	70.41 ± 10.20		27.41 ± 7.79	
Postgraduate degree	75.65 ± 18.91		29.08 ± 9.64	
Unit of employment				
Emergency medical service station	71.82 ± 12.35		28.36 ± 7.58	
Emergency call center	67.57 ± 12.64	***<0.001***[b]	28.68 ± 8.99	0.070[b]
Patient transport unit	66.66 ± 11.18		26.11 ± 8.39	
Administrative unit	63.55 ± 15.64		25.47 ± 7.44	
Length of service				
< 1 year	61.76 ± 14.60		34.20 ± 5.62	
1 – 5 years	68.00 ± 12.80		27.02 ± 8.77	
6 – 10 years	71.09 ± 12.92	***<0.001***[b]	29.21 ± 8.60	***<0.001***[b]
11 – 15 years	74.61 ± 8.89		26.06 ± 7.14	
≥ 16 years	69.01 ± 13.34		27.38 ± 6.03	
Occupational group				
EMTs	66.05 ± 13.53		28.57 ± 8.05	
Paramedics	71.13 ± 12.61	***<0.001***[b]	27.43 ± 7.96	0.298[b]
Physicians	67.00 ± 8.84		29.41 ± 9.69	
Have you ever received disaster medicine education before?				
Yes	71.39 ± 14.29	***0.005***[a]	28.48 ± 7.57	0.217[a]
No	67.62 ± 11.44		27.45 ± 8.37	
Do you want to receive disaster medicine education?				
Yes	69.10 ± 13.11	0.395[a]	28.43 ± 7.93	***<0.001***[a]
No	70.88 ± 11.18		23.74 ± 8.39	
How would you like to receive disaster medicine education?				
Traditional classroom	67.24 ± 12.48	0.063[a]	26.71 ± 7.44	***0.005***[a]
Online courses	70.00 ± 13.34		29.27 ± 8.04	

ATEL: Attitude Toward E-learning, DMKL: Disaster Medicine Knowledge Level, EMT: Emergency Medical Technician, SD: Standart Deviations.

a Independent t-test, b One-way ANOVA.

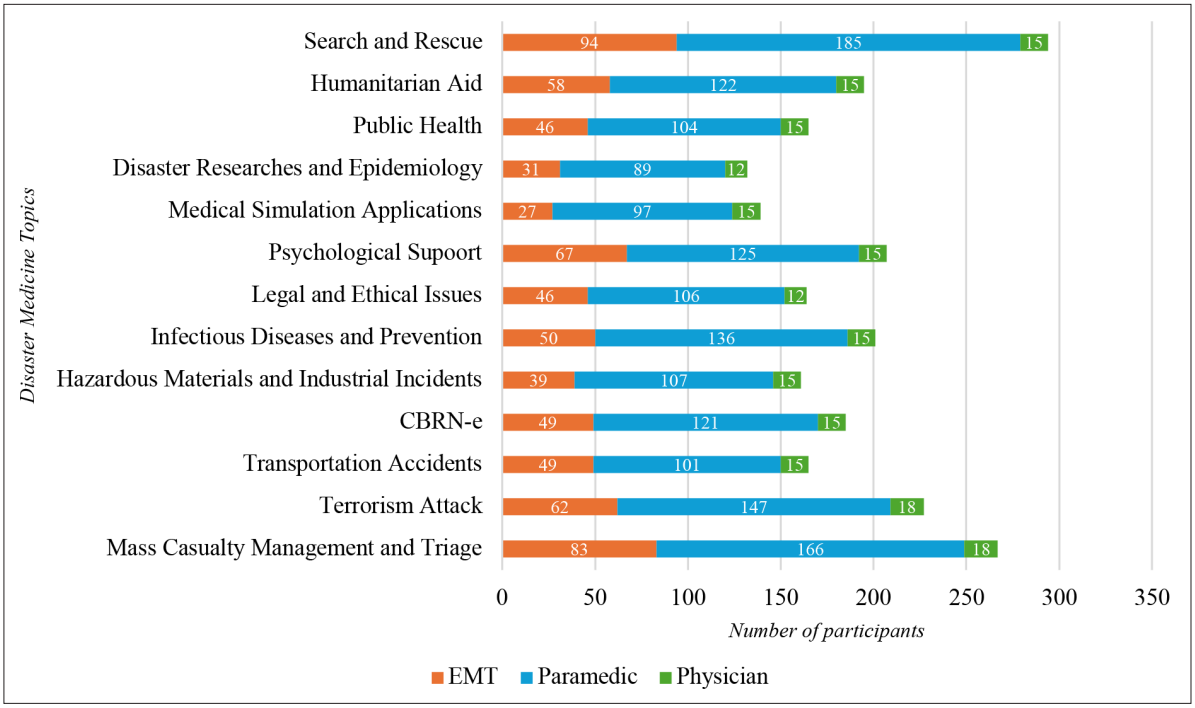

Figure 1. Distribution of participants requesting education in various disaster medicine topics
CBRN-e: Chemical, Biological, Radiological, Nuclear and Explosive

DISCUSSION

This study evaluated the disaster medicine knowledge levels and attitudes toward e-learning among prehospital healthcare personnel. The discussion section has been examined under three headings: Disaster Medicine Knowledge Levels, Attitudes Toward E-learning Levels, and Educational Expectations

Disaster medicine knowledge levels

As a result of the study, the mean disaster medicine scores, from highest to lowest, were observed among paramedics, physicians, and EMTs. Overall, it was found that more than half of the prehospital healthcare personnel possessed low levels of disaster medicine knowledge. A review of similar studies in the literature that evaluate the level of disaster medicine knowledge and educational needs of healthcare professionals reveals findings consistent with our results (20, 25-27). Additionally, a field report published about the devastating Kahramanmaraş earthquake on February 6, 2023, also indicated that healthcare workers were unprepared in terms of disaster-related knowledge and experience (28). The low levels of disaster medicine knowledge among prehospital healthcare personnel are thought to be due to insufficient coverage of disaster medicine topics in their undergraduate education and in-service training programs. Additionally, it was found that the disaster medicine knowledge level of personnel who had previously received disaster medicine education was higher compared to those who had not. This finding suggests that disaster education enhances awareness of disasters and familiarity with basic disaster-related information.

The higher disaster medicine knowledge scores observed among paramedics compared to other groups may be attributable to the fact that a significant number of paramedics have completed their undergraduate education in Emergency Aid and Disaster Management programs (29). In addition, the lower disaster medicine knowledge scores among personnel working in the patient transport unit and administrative unit, compared to those in the emergency medical service station, could be due to their primary focus on formal administrative duties, which may result in a decline in practical skills over time.

The correct responses to the question regarding the Simple Triage and Rapid Treatment (START) method

were low across all three groups. Unlike basic and advanced life support, the START method requires an assessment of the patient's level of consciousness (mental status) after the circulatory step (30). Unfortunately, it was observed that the majority of participants indicated that the assessment of consciousness should be conducted before evaluating respiration and perfusion. This is concerning given the importance of providing rapid care and effectively managing the scene of mass casualties. Additionally, the second most commonly incorrectly answered question was related to command and communication. The lack of standardization in the use of handheld radios and the variations between provinces may have contributed to prehospital healthcare personnel receiving low scores on this question (31).

Attitudes toward e-learning levels

In this study, it was found that the majority of prehospital healthcare personnel who had previously received disaster medicine education did so during their university years. Most prehospital healthcare personnel who had not received disaster medicine education expressed a desire to receive this training. This indicates their awareness of the potential need to work in disaster environments and their desire to be prepared. Furthermore, 67.4% of participants interested in receiving training reported a preference for online education. This preference has resulted in a significant difference in attitudes toward e-learning between those who favor traditional classroom education and those who prefer online education. This inclination towards digital learning platforms suggests that e-learning methods could be effectively utilized to address the current deficiencies in disaster medicine knowledge.

The positive attitude toward e-learning observed in this study aligns with findings from previous research, which highlight the advantages of e-learning in healthcare education. According to Ruiz et al. (2006), e-learning provides flexibility, accessibility, and the ability to update content rapidly, making it an effective tool for medical education (32). Additionally, Cook et al. (2008) found that e-learning is as effective as traditional learning methods in terms of knowledge gain and satisfaction among healthcare professionals (33). Furthermore, studies by Salas et al. (2012) and WHO (2015) emphasize the importance of integrating e-learning into emergency preparedness training, noting that it enhances the readiness and response capabilities of healthcare workers in disaster situations (34,35). These studies suggest that e-learning can bridge the gap in disaster medicine education by providing consistent, standardized, and easily accessible training. Given these findings, the integration of e-learning into disaster medicine education could significantly improve the preparedness of prehospital healthcare personnel. By leveraging the benefits of digital learning platforms, healthcare institutions can ensure that their staff is well-equipped to handle disaster scenarios effectively.

Educational expectations

Participants indicated that they would most like to receive education on search and rescue among the 13 educational options provided. Given that Turkey is a region with a high risk of disasters such as earthquakes and floods, this preference is not surprising (3). Following search and rescue, the most desired training topics were mass casualty management and triage, and terrorism attacks. The interest in these trainings reflects an awareness among prehospital healthcare personnel of their need to be prepared for a range of disaster scenarios, which are highly relevant to their roles. The low interest in disaster research and epidemiology, and medical simulation applications indicates a gap in the perceived relevance or importance of these topics among participants. While search and rescue, mass casualty management, and response to terrorism attacks are directly linked to immediate, hands-on disaster response, disaster research and epidemiology involve more abstract, long-term understanding and planning. The findings suggest a need to better communicate the benefits of medical simulation applications. Increasing awareness and integrating these topics into training programs could lead to more comprehensive preparedness and a more robust disaster response capability among prehospital healthcare personnel (36-38).

LIMITATIONS

This study has some limitations that should be considered when interpreting the results. Firstly, the study

sample is limited to prehospital healthcare personnel working in Istanbul. As a result, the findings may not be generalizable to prehospital healthcare personnel in other regions or countries. Another limitation is the use of a self-developed questionnaire to measure disaster medicine knowledge levels. Since there is no validated and reliable scale available in the literature for assessing disaster medicine knowledge, we had to develop our own instrument. This could affect the validity and reliability of the findings, as the questionnaire has not undergone the extensive testing and validation processes typically required for standardized measurement tools. Despite these limitations, the study also has several strengths. One key strength is the focus on prehospital healthcare personnel who are actively working in the field. Additionally, the use of a questionnaire developed based on literature and researchers' experience ensured that the measurement tool was grounded in practical and theoretical knowledge. This approach helped capture a comprehensive picture of disaster medicine knowledge.

CONCLUSIONS

In this study, the disaster medicine knowledge levels of prehospital healthcare personnel were assessed, and it was found that more than half (n=200) had a low level of disaster medicine knowledge. However, there is a strong interest in receiving disaster medicine education among these personnel. 68% of the personnel who wanted to receive disaster medicine education preferred online courses. Based on the findings of this study, it is evident that there is a need for targeted educational interventions to improve disaster medicine knowledge among prehospital healthcare personnel in Istanbul. Developing an online in-service education program for disaster medicine, tailored to current developments and needs, can systematically prepare these personnel for disaster response roles. Furthermore, making this education a mandatory component of in-service training can motivate those with lower levels of knowledge and enhance participants' confidence in their personal competencies. This will ultimately increase their effectiveness in disaster response, leading to better patient outcomes and more efficient healthcare delivery in disaster situations.

On a broader scale, similar online education programs can be adopted by prehospital care systems in other regions and countries. By addressing both immediate practical skills and broader strategic understanding, such programs can significantly improve preparedness and response capabilities globally. The integration of e-learning methods into disaster medicine education can provide consistent, accessible, and up-to-date training for healthcare personnel worldwide, enhancing their ability to respond effectively to disasters and improving overall public health resilience.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

REFERENCES

1. Lenjani B, Baftiu N, Krasniqi B, et al. Access and emergency medical care for massive or multiple injuries. Albanian J Trauma Emerg Surg. 2023;7(1):1181-8.
2. Beyramijam M, Farrokhi M, Ebadi A, Masoumi G, Khankeh HR. Disaster preparedness in emergency medical service agencies: a systematic review. J Educ Health Promot. 2021;10(1):258.
3. Sevinç Ö, Güner Y, Til A. Çanakkale ili 112 acil sağlık hizmetleri istasyonlarında çalışan personelin afet tıbbı konusundaki bilgi düzeyleri. Pamukkale Tıp Derg. 2018;11(2):119-25.
4. Kuday AD, Özcan T, Çalışkan C, Kınık K. Challenges faced by medical rescue teams during disaster response: A systematic review study. Disaster Med Public Health Prep. 2023;17(e548):1–10.
5. Westman A, Kurland L, Hugelius K. Non-technical skills needed by medical disaster responders- a scoping review. Scand J Trauma Resusc Emerg Med. 2024;32(1):25.
6. Voicescu G, Valente M, Corte FD, Ragazzoni L, Caviglia M. Medical Students' Education in Disaster Medicine: A Systematic Literature Review of Existing Curricula. Prehosp Disaster Med. 2023;38(S1):30
7. Kuday AD. Afetlerde Tıbbi Etik: Ne Kadar Uygulanabilir?. Acil Yardım ve Afet Bilimi Dergisi. Eylül 2023;3(2):42-48.
8. Bahattab A, Zain O, Linty M, Hubloue I, Della Corte F, Ragazzoni L. Development and evaluation of e-learning tool for humanitarian public health training. Prehosp

Disaster Med. 2022;37(S2):93.
9. Ladeira LM, Cardoso IM, Correia AM, Rato F. Emergency medical teams (EMT) education and training – improving disaster preparedness with the Portuguese emergency medical team (PT EMT) e-learning course. Prehosp Disaster Med. 2022;37(S2):103.
10. Paquay M, Goffoy J, Chevalier S, Servotte JC, Ghuysen A. Relationships between internal factors, social factors and the sense of presence in virtual reality-based simulations. Clin Simul Nurs. 2020;62:1-11.
11. Manjeese C. Divulging the efficacy of e-learning through the eyes of university students: lessons from a third world perspective. Phys Chem Earth A/B/C. 2022;127:103187.
12. Lytovchenko I, Terenko O, Lavrysh Y, Ogienko O, Avsheniuk N, Lukianenko V. Training delivery methods implemented by American companies: opportunities and challenges in context of knowledge society. Postmod Open. 2022;13(4):187-98.
13. Hammad KS, Arbon P, Gebbie KM. Emergency nurses and disaster response: an exploration of South Australian emergency nurses' knowledge and perceptions of their roles in disaster response. Australas Emerg Nurs J. 2011;14(2):87-94.
14. Çalışkan C, Algan A, Koçak H, Biçer BK, Şengelen M, Çakir B. Preparations for Severe Winter Conditions by Emergency Health Personnel in Turkey. Disaster Med Public Health Prep. 2014;8(2):170-3.
15. Koçak H, Çaliskan C, Kaya E, Yavuz Ö, Altintas KH. 28. Determination of individual preparation behaviors of emergency health services personnel towards disasters. Journal of Acute Disease. 2015;4(3):180-5
16. Karasar N. Bilimsel araştırma yöntemi: kavramlar ilkeler teknikler. Ankara: Nobel Akademik Yayıncılık; 2023.
17. Kotora JG. An assessment of chemical, biological, radiologic, nuclear, and explosive preparedness among emergency department healthcare providers in an inner city emergency department. Am J Disaster Med. 2015;10(3):189-204.
18. Bıçakcı N, Bıçakcı S, Çetin M. Evaluation of disaster medicine knowledge level and educational approaches of future health professionals. Namık Kemal Med J. 2022;10(1):59-73.
19. Kaji AH, Coates W, Fung CC. A disaster medicine curriculum for medical students. Teach Learn Med. 2010;22(2):116-22.
20. Su T, Han X, Chen F, et al. Knowledge levels and training needs of disaster medicine among health professionals, medical students, and local residents in Shanghai, China. PLoS One. 2013;8(6):e67041.
21. Barrimah I, Adam I, Al-Mohaimeed A. Disaster medicine education for medical students: is it a real need? Med Teach. 2016;38(sup1):S60-5
22. European Master Disaster Medicine. 2017. [cited 2023 Aug 1]. EMDM Course Program XIX edition. Available from: https://www.dismedmaster.com/course/#!/program-teachers.
23. Zabadi AM, Al-Alawi AH. University students' attitudes towards e-learning: university of Business and Technology (uBT)-Saudi Arabia- Jeddah: a case study. Int J Bus Manag. 2016;11(6):286-95.
24. Aydın M, Şahin CU, Kulakaç N. Hemşirelik öğrencilerinin e-öğrenmeye yönelik tutum ölçeği: metodolojik bir çalışma. Türkiye Klinikleri Hemşirelik Bilimleri Derg. 2022;14(2):464-71.
25. Barış E. Afet tıbbı eğitiminin İzmir metropol alanda acil sağlık hizmetlerinde çalışan hekimlerin bilgi düzeyine etkisi (Yayımlanmamış Yüksek Lisans Tezi). Dokuz Eylül Üniversitesi, İzmir, 2011.
26. Çelebi İ, Uçku RŞ. Kayseri ili 112 acil sağlık hizmetlerinde görev yapan sağlık personelinin deprem bilgi düzeyi ve etkileyen etmenler. Hastane Öncesi Derg. 2017;2(2):91-103.
27. Naser WN, Saleem HB. Emergency and disaster management training; knowledge and attitude of Yemeni health professionals- a cross-sectional study. BMC Emerg Med. 2018;18(1):1-12.
28. Yılmaz S, Karakayali O, Yilmaz S, et al. Emergency Medicine Association of Turkey Disaster Committee Summary of field observations of February 6th Kahramanmaraş earthquakes. Prehosp Disaster Med. 2023;38(3):415-8
29. Kaya U. Kuzey Kıbrıs'ta ilk ve acil yardım (paramedik) eğitimi. J Paramed Emerg Health Serv. 2021;2(1):26-30.
30. Aslan R, Şahinöz S, Şahinöz T. Determination of START triage skill and knowledge levels of prehospital emergency medical staff: a cross sectional study. Int Emerg Nurs. 2021;56:101004.
31. Budd C. Informatics and telecommunications in disaster. In: Ciottone Gr, Biddinger PD, Darling RG, Fares S, Keim ME, Molloy MS, Süner S, editors. Ciottone's disaster medicine, 2nd edition. Philadelphia: Elsevier, 2016; p. 149-155.
32. Ruiz JG, Mintzer MJ, Leipzig RM. The impact of E-Learning in Medical Education. Acad Med. 2006;81(3):207-212.
33. Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Internet-based learning in the health professions: a meta-analysis. JAMA. 2008;300(10):1181-1196.

34. Salas E, Tannenbaum SI, Kraiger K, Smith-Jentsch KA. The Science of Training and Development in Organizations: What Matters in Practice. Psychol. Sci. Public Interest. 2021;13(2):74-101.
35. World Health Organization. 2015. [cited 2023 Aug 5]. eLearning for under- graduate health professional education: a systematic review informing a radical transformation of health workforce development. World Health Organization. Available from: https://iris.who.int/handle/10665/330089
36. Mahdi SS, Jafri HA, Allana R, et al. Systematic review on the current state of disaster preparation Simulation Exercises (SimEx). BMC Emerg Med. 2023;23(1):52.
37. Arafeh JMR. Simulation-based training. J Perinat Neonatal Nurs. 2017;31(4):286-9.
38. Gue S, Cohen S, Tassone M, et al. Disaster day: a simulation-based competition for educating emergency medicine residents and medical students on disaster medicine. Int J Emerg Med. 2023;16(1):59.