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Evaluation of Disaster Medicine Knowledge Level and Educational Approaches of Future Health Professionals

Geleceğin Sağlık Profesyonellerinin Afet Tıbbı Bilgi Düzeyi ve Eğitim Yaklaşımlarının Değerlendirmesi

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ABSTRACT

Aim: This study aimed to determine the disaster medicine knowledge levels and educational approaches on disaster medicine of prospective healthcare students who are important factors of disaster response.

Materials and Methods: This cross-sectional descriptive study was conducted with final year students from the nursing department, the Emergency Aid and Disaster Management (EADM) Department, and the Medical Faculty at Tekirdağ Namık Kemal University in Tekirdağ, Turkey. The data were collected through a face-to-face administered questionnaire.

Results: Among the 159 study participants, 49% (n=78) of the participants had received disaster medicine education. The mean knowledge level of the EADM student group (78.96±10.56) was found to be higher than nurse (65.49±12.84) and medicine (72.33±10.56) student groups. Most of the students with high level of knowledge (n=56, 58.9%) participated in the disaster drill. Personal protective equipment (PPE) (n=30, 18.8%), decontamination (n=52, 32.7%) and triage (n=60, 37.7%) questions were respectively answered correctly with the lowest percentage. Students (n=82, 92.1%) who did not receive disaster medicine education stated that they wanted to receive disaster medicine education and most of students (n=115, 72.3%) preferred that disaster medicine courses be led by emergency medicine specialists.

Conclusion: Disaster medicine classes that address some special subjects like the use of PPE and decontamination procedures and triage should be included in the basic curriculum of health professions, and students' personal knowledge and competence perceptions on disaster medicine should be supported by reinforcing the learning outcomes with disaster drills.

Keywords: Disaster medicine, education, health profession students

ÖZ

Amaç: Bu çalışma, afet müdahalesinin önemli faktörleri olan sağlık öğrencilerinin afet tıbbı bilgi düzeylerini ve afet tıbbına yönelik eğitim yaklaşımlarını belirlemeyi amaçlamıştır.

Gereç ve Yöntem: Bu kesitsel tanımlayıcı tasarım çalışması, Türkiye'de Tekirdağ Namık Üniversitesi'ndeki Hemşirelik Bölümü, Acil Yardım ve Afet Yönetimi (AYAY) Bölümü ve Tıp Fakültesi son sınıf öğrencileri ile gerçekleştirilmiştir. Veriler yüz yüze uygulanan anket yoluyla toplanmıştır.

Bulgular: Araştırmaya katılan 159 kişiden %49'u (n=78) afet tıbbı eğitimi almıştır. AYAY öğrenci grubunun bilgi düzeyi ortalaması (78,96±10,5) hemşirelik (65,49±12,84) ve tıp (72,33±10,56) öğrenci gruplarına göre daha yüksek bulunmuştur. Bilgi düzeyi yüksek olan öğrencilerin büyük kısmı (n=56, %58,9) afet tatbikatına katılmıştır. Kişisel koruyucu ekipman (KKE) (n=30, %18,8), dekontaminasyon (n=52, %32,7) ve triyaj (n=60, %37,7) konularına ait sorular sırasıyla en düşük oranda doğru yanıtlanan sorular olarak tespit edilmiştir. Afet tıbbı eğitimi almayan öğrenciler (n=82, %92,1)

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afet tıbbı eğitimi almak istediklerini belirtmiş ve çoğu öğrenci (n=115, %72,3) afet tıbbı derslerinin acil tıp uzmanları tarafından verilmesini tercih etmiştir.

Sonuç: Sağlık mesleklerinin temel müfredatında KKE kullanımı, dekontaminasyon prosedürleri ve triyaj gibi konulara özel vurgu yapılan afet tıbbı derslerine yer verilmeli ve öğrenme çıktıları afet tatbikatları ile pekiştirilerek öğrencilerin afet tıbbı konusundaki kişisel bilgi ve yeterlilik algıları desteklenmelidir.

Anahtar Kelimeler: Afet tıbbı, eğitim, sağlık meslek öğrencileri

INTRODUCTION

Today's world has witnessed a steady increase in disasters, and greater populations of people are being directly or indirectly affected by these disasters[1-3]. This means, in effect, that there is a high possibility that at one point, other people will encounter disasters in their lifetime. Due to the random and unpredictable nature of most disasters, it is difficult to predetermine potential disaster victims and the teams that will be responsible for responding to disasters. Regardless of the professional field in which a doctor operates, they may be required to undertake an active role in patient care, field management, or incident command during disasters[4,5]. Students who are educated to be health professionals can also be assigned to provide health services in disasters as in various periods of history, or their voluntary participation in health service delivery can be encouraged as in the Coronavirus disease-2019 (COVID-19) pandemic process[6-11]. The American Medical Association, the Association of American Medical Colleges, and the World Association for Disaster and Emergency Medicine have all suggested that disaster medicine should be included in the medical education curriculum under various subjects[12-14]. Currently, disaster medicine is not at the desired level in global medical education curricula.

In examining medical education in Turkey in terms of disaster medicine training, it was found that the Undergraduate Medical Education National Core Education Program 2020 included only a few topics on disaster concepts under the title of Behavioral, Social, and Human Sciences Lists and that basic medical care practices included no courses on disaster medicine[15]. In other words, there is no standard disaster medicine education in medical faculties, and disaster medical care is not considered a professional medical field in Turkey. However, emergency medicine specialists receive education on the subject of disaster medicine as part of the "Emergency Medicine Education Core Curriculum"[16]. Like doctors, nurses also function as the foremost health care professionals responsible for providing healthcare services in disaster responses. Yet, despite the well-established, comprehensive content constituting the Nursing National Core Education Program in Turkey, the program lacks structured disaster medicine content[17]. The Emergency Aid and Disaster Management (EADM) program provides disaster management and undergraduate education on emergency situations in Turkey, as well as education on disaster medicine subjects and other fields of disaster. At the Tekirdağ Namık Kemal University, for students enrolled in the EADM department, the "Disaster Medicine I-II" course is mandatory; for nursing department students, the "Nursing Care During Disasters and First Aid" course is elective. There is, however, no structured disaster medicine course offered to students enrolled in the medical faculty.

The primary aim of this study is to determine the disaster medicine knowledge level and educational expectations for disaster medicine of prospective health practitioners, considering the important role they will play in the disaster responses of today and the future. The secondary aim of this study is to provide supporting evidence on the necessity of making disaster medicine education widespread in the curriculum of medicine and other health sciences by demonstrating how health practitioners' disaster medicine knowledge level can increase through the provision of disaster medicine education.

MATERIALS AND METHODS

This cross-sectional descriptive study was carried out in the 2019-2020 academic year with sixth-year students of the medical faculty, fourth-year students of the Nursing Department, and fourth-year students of the EADM Department at Tekirdağ Namık Kemal University in Tekirdağ, Turkey. Only final-year students (n=217) from these programs were chosen because their vocational curriculum was about to be completed, meaning that these students would likely have an important advantage insofar as taking a more holistic approach to disasters. The whole universe was included in the study without choosing a sample, and a questionnaire was applied to a total of 159 students who could be reached.

The participating students were asked to fill out a questionnaire consisting of 38 questions arranged under three sections (Appendix 1). The first section of the questionnaire includes seven questions addressing the students' demographics and education, such as their age, gender, department of study, disaster medicine education, and disaster drill experiences. The second section, disaster medicine knowledge level, includes 25 questions on topics such as basic disaster information, introduction to disaster medicine, fundamental principles of disaster management, decontamination, cardiopulmonary resuscitation, infectious diseases, public

health, and mental health. The third section has six questions, four of which are multiple-choice and open-ended questions about the educational approach toward disaster medicine education, and two of which involve self-assessment of competence and knowledge levels, where the participants rated themselves from 0 to 10. The total possible value of the disaster medicine knowledge level questions is four points, and there is only one correct answer to each of the four multiple choice questions. Scores of 70 points and higher, which fall within the 75th percentile on the scale of 100, indicate a high level of knowledge about disaster medicine, while scores below 70 indicate a low level of knowledge of disaster medicine.

The questionnaire was developed by the researchers based on previous studies and data published by the Centers for Disease Control and Prevention Disaster Preparedness and Response: Complete Course Facilitator Guide and the Didactical Course of the European Master Program in Disaster Medicine[18-23].

Prior to conducting the study, the participants were provided detailed information about its content and aim and they gave their written consent. This study was approved by the Tekirdağ Namık Kemal University Non-invasive Ethics Committee (decision date-no: 24.09.2019-2019.138.08.10).

Statistical Analysis

In this study, continuous data were analyzed as mean and plus/minus standard deviation, while categorical data were analyzed as a percentage (%). Normal distribution of the data was evaluated using the Shapiro-Wilk test, with normally distributed groups being compared using the one-way ANOVA in cases where the number of groups was three and higher. Results from the crosstab analysis performed were evaluated based on the Pearson chi-square test. All statistical analyses were carried out using the IBM Statistical Package for the Social Sciences (SPSS) Statistics 21.0 program (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, version 21.0. Armonk, NY: IBM Corp.). Statistical significance was accepted as $p<0.05$.

RESULTS

Of the 217 students constituting the population, 73.2% (n=159) filled out the questionnaire. Only those students who fully completed the questionnaires were included in the study.

Participants' Demographic Data

Among the study participants, 45.9% (n=73) were studying in the medical faculty; 37.1% (n=59) in the nursing department; and 16.9% (n=27) in the EADM department. 64.5% (n=102) of the participants were female, 49% (n=78) reported that they had received education about disaster medicine, and 57.8% (n=92) reported that they had participated in a disaster drill before. Furthermore, only 3 of the participants (1.8%) reported that they were not interested in receiving disaster medicine education. Table 1 presents the participants' demographic data.

Knowledge Level

Table 2 presents brief information about the questions used in the knowledge level evaluation and the students' responses. The mean score was 72.33±10.56 (40.00-96.00) for the medical faculty students, 65.49±12.84 (24.00-84.00) for the nursing students, and 78.96±10.56 (56.00-96.00) for the EADM students. Of all the participants, 62 (38.9%) had a low knowledge level, and 97 (61%) had a high knowledge level. In terms of the student groups, it was found that 69.8% (n=51) of the medical faculty students, 40.6% (n=24) of the nursing department students, and 81.4% (n=22) of the EADM students had a high knowledge level. The results further showed that for all three student groups, higher disaster medicine knowledge levels corresponded to female gender and participation in a disaster drill. Moreover, having received disaster medicine education was associated with higher knowledge levels in students who were studying in the nursing department and those who were in the EADM department. However, there was no relationship between being a student in the medical faculty and high knowledge level. None of the participants answered all the questions correctly, nor was there one question answered correctly by all the participants. The question that was most correctly answered by the participants (n=152 95.5%) was Q1, about medical attention priority, while the question with the lowest correct answer rate (n=30 18.8%) was Q4, about the use of personal protective equipment (PPE), and Q1, Q2, and Q19 were correctly answered by all EADM students. The medical faculty students had lower correct answer rates on the questions related to the use of PPE, decontamination procedures, and triage.

Educational Approach Toward Disaster Medicine

Most of the students (58.4%) stated that education on disaster medicine should be carried out through "video conference." The least (n=42) preferred (26.4%) method for receiving disaster medicine education was "online web-based courses." One hundred-fifteen participants (72.3%) felt that disaster medicine education should be provided by "emergency medicine" specialists and that the duration of education should be "an academic year or a specifically designated period" (n=82) (Table 3). A student enrolled in the medical faculty stated, "the disaster medicine education should be provided during the sixth academic year in place of elective internships". Another participant suggested, "disaster medical care education should be provided by categorizing disaster types and spreading them out across academic years".

Table 4 shows the participants' average knowledge level and competence level according to their own estimations. EADM students' estimations of their personal knowledge level and competence level in all subjects were higher than those of students from other departments.

When participants were asked about the subject that they wished to receive disaster medicine education, "earthquakes" was the most (n=121, 76.1%) and "disaster epidemiology" was the least (n=40 25.1%) preferred response (Figure 1).

DISCUSSION

This study evaluated the disaster medicine knowledge levels and expectations for disaster medicine education of final-year students in the medical faculty, the nursing department, and the EADM department of Tekirdağ Namık Kemal University. Although this study was carried out with a lower number of participants compared to that seen in similar studies in the literature, it is unique in terms of the variety of the participants constituting the sample in Turkey[18,20,24-26]. This study found that most of the students who received disaster medicine education did so during their undergraduate years. Moreover, most of the students who reported that they had not received disaster medicine education during their undergraduate education were interested in receiving education on this subject. Similar to the study of Wunderlich et al.[24], the participants stated that they wanted to receive training in disaster medicine. The fact that the participants who had not received disaster medicine education before wanted to receive this education is a promising indicator for that these future health practitioners are aware of the fact that they may have to work during disasters and in disaster environments, and they want to be prepared for this. Undergraduate education forms the backbone of health professionals' occupational knowledge, skill acquisitions, their future in-service trainings, and lifelong learnings[27,28]. As Markenson et al.[29] stated, healthcare students need to be trained so as to be capable of undertaking tasks during disasters, as these tasks are an integral part of their profession. A common national disaster medicine education curriculum that is structured based on up-to-date developments and needs, which supports interdisciplinary cooperation, and that can be adapted according to the competencies of disciplines can help future health professionals to be more safely and systematically prepared for disaster response roles[30,31].

Table 1. Participants' personal information

	Medicine (n=73)	Nursing (n=59)	EADM (n=27)	p
Age (year)				
Mean±SD	24.918 (2.350)	22.966 (2.742)	22.222 (1.805)	<0.001[1]
Range	23.000-33.000	20.000-36.000	20.000-29.000	
Gender (%)				
Female	42 (57.5)	47 (79.7)	13 (48.1)	0.005[2]
Male	31 (42.5)	12 (20.3)	14 (51.9)	
Have you ever received education about disaster medicine? (%)				
Yes	11 (15.1)	40 (67.8)	27 (100.0)	<0.001[2]
No	58 (79.5)	16 (27.1)	0 (0.0)	
I do not know	4 (5.5)	3 (5.1)	0 (0.0)	
3. If so, where did you receive your disaster medicine education? (%)				
Undergraduate education	6 (60.0)	34 (85.0)	27 (100.0)	0.012[2]
Non-governmental organizations	2 (20.0)	2 (5.0)	0 (0.0)	
Internet	1 (10.0)	0 (0.0)	0 (0.0)	
Other resources	1 (10.0)	4 (10.0)	0 (0.0)	
3. If no, do you want to receive disaster medicine education? (%)				
Yes	60 (92.3)	21 (91.3)	1 (100.0)	0.671[2]
No	3 (4.6)	0 (0.0)	0 (0.0)	
I have no idea	2 (3.1)	2 (8.7)	0 (0.0)	
Have you ever participated in a disaster drill? (%)				
Yes	31 (42.5)	43 (74.1)	18 (69.2)	<0.001[2]
No	42 (57.5)	15 (25.9)	8 (30.8)	

[1]Linear Model ANOVA, [2]Pearson's chi-square test

EADM: Emergency Aid and Disaster Management, SD: Standard deviation

Contrary to the study of Arslan et al.[26], the rate of participation in disaster drills of the students was high. Disaster drills provide unique opportunities for future health professionals to, at the very least, experience the chaotic environments of disasters and to be prepared for their tasks in disasters. Previous studies show that drills can serve to develop health professionals' competence in practice-based subjects, such as incident command, triage, patient care, evacuation, and decontamination procedures[31-35]. Healthcare students should be given the opportunity to participate in disaster drills, and their participation should be encouraged. Conducting these drills with the simultaneous participation of multiple disciplines in undergraduate education would provide students the opportunity to experience the cooperative working environment and prepare them to quickly act together when necessary.

The participants' disaster medicine knowledge levels varied between groups. The fact that participants who had participated in disaster drills had higher knowledge levels suggests that drills foster disaster awareness and familiarity with basic information about disasters. Contrary to expectations and the current literatures, the high level of disaster medicine knowledge seen in the medical students, despite the lack of a standard structured disaster medicine curriculum, could be attributed to the fact that this subject is scattered throughout the curriculum of different clinical branches[18,24,25,36]. In this context, it would be fairly easy to simply gather the existing disaster medicine subjects and additional related subjects under the title of "disaster medicine" and add this to the medical education curriculum. This would be an encouraging step for students, educators, and education content planners alike in terms of fostering disaster medicine education. At the same time, the authors also recognize that a national study may produce also different results. The low knowledge level results of the nursing students are worrying. It is likely that these results are a consequence of disaster medicine and nursing subjects being provided in a single academic term as an elective course. Making disaster medicine a mandatory course in the nursing curriculum could be motivating for both educators and students and lead to an increase in students'

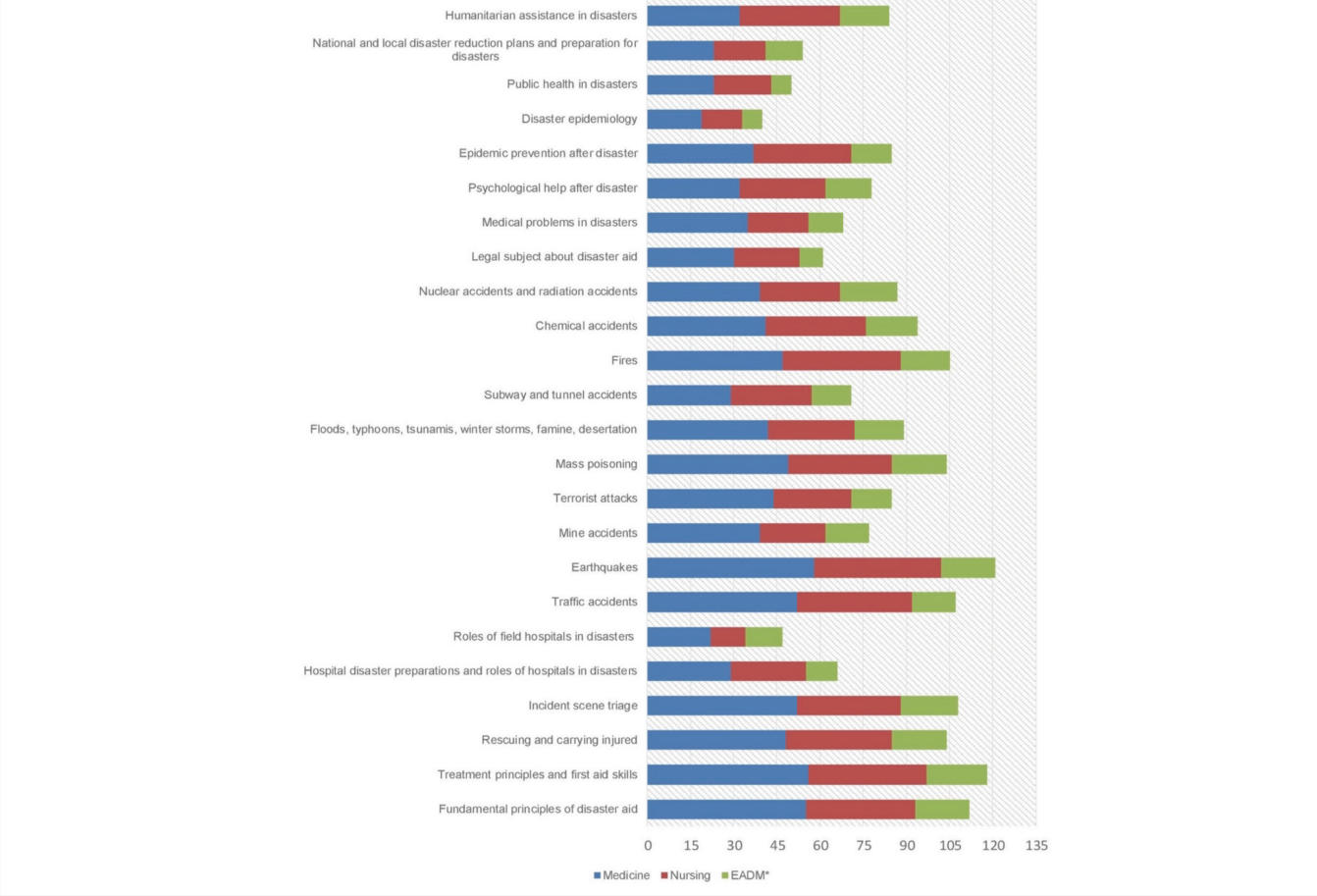

Figure 1. Number of students who want to receive education on various disaster medicine subject

EADM: Emergency Aid and Disaster Management

knowledge levels and the confidence they have in their personal knowledge and competence.

The medical faculty students reported that their knowledge levels and self-competence levels were low, despite proving to have high knowledge levels. This lack of confidence could lead to setbacks in patient care, critical decision-making, and incident command stages, and thereby increase the mortality and morbidity of victims of disasters. Being provided a disaster medicine course could positively contribute to improving the confidence that medical students have in their personal knowledge and competence levels. The fact that the EADM students received disaster medicine education likely played a big role in their high knowledge levels and their higher self-perceptions of personal knowledge and competence on the subject, as compared to other student groups. The preparedness and competence of healthcare professionals in extraordinary events, such as disasters, are valuable insofar as these would enable them to assume a managerial role and perform their duties in a focused/professional manner when disasters occur in their communities[28].

Knowledge about the use of PPE was low in all three groups. This is concerning considering how important it is that the personnel can efficiently use PPE to protect themselves and other patients in healthcare environments. It has been well established that with appropriate trainings, the inaccurate usage of PPE can be prevented[37]. A study related to the COVID-19 pandemic in Wuhan, China, which investigated the healthcare professionals responsible for the care of COVID-19 patients, demonstrated the importance of appropriate PPE usage, in that it found there to be no incidences of infection in the study participants despite the high exposure risks[38].

Contrary to the study by Barrimah et al.[21], this study revealed that participants preferred to receive disaster medicine training via videoconferencing during an academic year or during a certain period. Students were most interested in receiving education about how to respond to earthquakes,

Table 2. Number and percentage of students who correctly answered the disaster medicine knowledge level questions according to their departments

Knowledge level questions		Total (%)	Medical (%)	Nursing (%)	EADM (%)
Q1	Medical attention priority	152 (95.59)	70 (95.9)	55 (94.8)	27 (100)
Q2	Triage coding	147 (92.45)	62 (84.9)	58 (98.3)	27 (100)
Q3	Knowledge about decontamination procedures	52 (32.7)	32 (43.8)	8 (13.6)	12 (44.4)
Q4	Knowledge about the use of PPE	30 (18.86)	15 (26.3)	6 (11.3)	9 (33.3)
Q5	Management of biological agents	145 (91.19)	71 (97.3)	49 (83.1)	25 (96.2)
Q6	Cardiopulmonary resuscitation procedures	119 (74.84)	61 (83.6)	32 (54.2)	26 (96.3)
Q7	Knowledge about disaster management steps	149 (93.71)	70 (95.9)	53 (89.8)	26 (96.3)
Q8	Knowledge about public health in disasters	132 (83.01)	63 (87.5)	44 (74.6)	25 (92.6)
Q9	Knowledge about infectious diseases	95 (59.74)	35 (50.7)	38 (65.5)	22 (81.5)
Q10	Crush syndrome management	93 (58.49)	50 (68.5)	19 (32.2)	24 (88.9)
Q11	Knowledge about post-traumatic stress disorder	135 (84.9)	56 (76.7)	54 (91.5)	25 (92.6)
Q12	Psychological first aid	145 (91.19)	69 (94.5)	55 (93.2)	21 (80.8)
Q13	Use of resources in disasters	122 (76.72)	58 (86.6)	41 (70.7)	23 (85.2)
Q14	Chemical disaster response	112 (70.44)	46 (63.0)	45 (76.3)	21 (77.8)
Q15	Knowledge about incident command system	110 (69.18)	53 (73.6)	32 (55.2)	25 (92.6)
Q16	Media and public relations	141 (88.67)	66 (90.4)	53 (89.8)	22 (81.5)
Q17	Knowledge about disaster management steps	143 (89.93)	66 (91.7)	52 (91.2)	25 (92.6)
Q18	Trauma patient management	115 (72.32)	59 (81.9)	32 (56.1)	24 (88.9)
Q19	Basic disaster knowledge	131 (82.38)	62 (86.1)	42 (73.7)	27 (100)
Q20	Legal legislation knowledge about disasters	108 (67.92)	54 (78.3)	41 (69.5)	13 (48.1)
Q21	Knowledge about decontamination procedures	75 (47.16)	29 (43.9)	26 (44.1)	20 (74.1)
Q22	Communication in disasters	125 (78.61)	58 (80.6)	48 (82.8)	19 (73.1)
Q23	Simple Triage and Rapid Treatment triage knowledge	60 (37.73)	20 (31.2)	30 (50.8)	10 (37.0)
Q24	Management of mass deaths	103 (64.77)	49 (71.0)	33 (58.9)	21 (77.8)
Q25	Radioactive disaster response	80 (50.31)	46 (64.8)	20 (33.9)	14 (51.9)

Q: Question, EADM: Emergency Aid and Disaster Management, START: Simple Triage and Rapid Treatment

Table 3. Students' disaster medicine education choices

	Medicine n (%)	Nursing n (%)	EADM n (%)	p
Disaster medicine education method				
Classical classroom lectures/lecture presentations	30 (41.1)	28 (47.5)	23 (85.2)	<0.001
Video conference	40 (54.8)	41 (69.5)	12 (44.4)	
Video, podcast	26 (35.6)	22 (37.3)	11 (40.7)	
Online web-based courses	26 (35.6)	11 (18.6)	5 (18.5)	
Personal textbooks, brochures	26 (35.6)	14 (23.7)	5 (18.5)	
I have no idea	9 (12.3)	4 (6.8)	0 (0.0)	
Disaster medicine education duration				
An academic year or a specific period	27 (38.6)	31 (52.5)	24 (88.9)	0.238
3-5 days of workshops/conferences before graduation	27 (38.6)	14 (23.7)	2 (7.4)	
Two hours a week during the final academic year	13 (18.6)	12 (20.3)	0 (0.0)	
Other	3 (4.3)	2 (3.4)	1 (3.7)	
The branch of the teacher who will provide disaster education				
Emergency medicine	51 (69.9)	40 (67.8)	24 (88.9)	0.450
Family practice	0 (0.0)	1 (1.7)	0 (0.0)	
Public health	17 (23.3)	12 (20.3)	2 (7.4)	
Any clinical branch	0 (0.0)	1 (1.7)	0 (0.0)	
I have no idea	5 (6.8)	5 (8.5)	1 (3.7)	

EADM: Emergency Aid and Disaster Management

Table 4. Participants' averages regarding self-assessment of their personal knowledge level and competence level according to the 0–10-point visual analog scale

	Personal knowledge level estimation			Personal competence level estimation		
	Medicine	Nursing	EADM	Medicine	Nursing	EADM
Chemical incidents	3.10	3.35	4.70	2.96	2.75	4.19
Biological incidents	3.66	3.95	5.00	3.74	3.49	4.15
Radiological incidents	2.90	2.86	4.63	2.46	2.25	3.65
Nuclear incidents	2.49	2.82	4.70	2.21	2.42	3.50
Natural disasters	4.37	5.53	7.04	4.26	5.12	6.38
Epidemics	4.92/10	5.25/10	5.48/10	4.54	4.75	5.42

EADM: Emergency Aid and Disaster Management

which is not surprising considering that much of Turkey's geography lies on high-risk areas for earthquakes, and that earthquakes are a disaster type that causes the most loss of life and property in Turkey[39]. The students further indicated that they most preferred disaster medicine education to be provided by emergency medicine specialists. This preference likely stems from emergency medicine expertise being seen as a clinical branch that involves a holistic approach toward complex and extraordinary health issues, and from the ability of emergency medicine specialists to organize their clinics like a disaster manager during their routine emergency service operations. Considering these matters in the planning of content and methods for disaster medicine courses will provide key contributions to achieving educational goals.

Study Limitations

The main limitation of this study is that it was a single-center study. Including students from earlier academic years could yield different results. Secondly, the self-evaluations of the participants about their knowledge and competence levels may not be fully reliable. Studies carried out in multiple centers with broad sample sizes could provide more valuable data.

CONCLUSION

This study has revealed that future health professionals are interested in receiving disaster medicine education. It is recommended that disaster medicine courses be generalized with special emphasis on certain special subjects, such as the use of the PPE and decontamination procedures, in order

to increase knowledge level and personal knowledge, and competence level perception and to reinforce those gains with disaster drills. The results from this study can contribute to the design of disaster medicine courses that should be added to the basic curricula of health professions.

Ethics

Ethics Committee Approval: This study was approved by the Tekirdağ Namık Kemal University Non-Interventional Research Ethics Committee on 28.09.2019 with the protocol number 2019.138.08.10 and decision number 10.

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: N.B., S.B., M.Ç., Design: N.B., S.B., M.Ç., Data Collection or Processing: S.B., M.Ç., Analysis or Interpretation N.B., S.B., M.Ç., Literature Search: N.B., Writing: N.B., S.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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Appendix 1. Evaluation of disaster medicine knowledge level of future health practitioners

Questionnaire

1. PERSONAL INFORMATION

1) Age: .....

2) Gender

☐ **A.** Female ☐ **B.** Male

3) In which department are you enrolled?

☐ **A.** Medicine ☐ **B.** Nursing ☐ **C.** Emergency Aid and Disaster Management

4) Have you ever received any educational training on disaster medicine?

☐ **A.** Yes ☐ **B.** No ☐ **C.** I do not know

5) 4. If your answer is yes, where did you receive the educational training on disaster medicine?

☐ **A.** Undergraduate Education
☐ **B.** Non-governmental organizations
☐ **C.** Internet
☐ **D.** Other resources

6) 4. Soruya yanıtınız hayır ise; Afet tıbbı eğitimi almak ister misiniz?

☐ **A.** Yes ☐ **B.** No ☐ **C.** I do not know

7) Have you ever participated in a disaster drill?

☐ **A.** Yes ☐ **B.** No

2. KNOWLEDGE LEVEL

1) You will give medical attention to the injured and other survivors after a mining accident at the scene of the accident. Which group of patients will you prioritize for medical attention?

☐ **A.** Those who are severely injured, dying and unable to benefit from resuscitative interventions
☐ **B.** Those with fatal injuries but possibly able to survive if immediate treatment is applied
☐ **C.** Those who are in stable condition but have serious injuries and need treatment
☐ **D.** Those whose injuries are not serious

2) You are assigned as triage personnel after a bombing at a festival. One of the injured is a 25-year-old female patient, who has a left leg transfemoral amputation and a 4 cm-laceration over the right eyebrow. RR (respiration rate): 31 / min, capillary refill time: 4 sec; she makes meaningless sounds and cannot answer your questions. Which triage color will you choose to code this patient?

☐ **A.** Green
☐ **B.** Yellow
☐ **C.** Red
☐ **D.** Black

3) How would you decontaminate survivors who were exposed to leakage of a chemical substance in a factory?

- ☐ **A.** By washing them with warm water and soap.
- ☐ **B.** By wiping them with 5%-hypochlorite solution.
- ☐ **C.** By identifying the chemical substance and using its specific antidote.
- ☐ **D.** I do not know.

4) What level of personal protective equipment is recommended for use in decontamination procedures at hospitals?

- ☐ **A.** A
- ☐ **B.** B
- ☐ **C.** C
- ☐ **D.** D

5) What would your thoughts be about a patient who was admitted to the health institution you work at with high fever, fatigue, headache, pain in the muscles and joints, and rashes on their skin, and you find out from their medical history that they just returned from a West Africa trip?

- ☐ **A.** I would think that they have an upper respiratory infection. I would suggest that they take their medication and rest.
- ☐ **B.** I would suspect they had an allergic reaction and recommend they take an allergy test.
- ☐ **C.** It could be viral hemorrhagic fever (e.g. Ebola). I would consult the relevant specialist.
- ☐ **D.** I do not know.

6) What is the first stage of cardiopulmonary resuscitation?

- ☐ **A.** Applying defibrillation with the highest energy dosage (200&360j) of the defibrillator
- ☐ **B.** Administrating oxygen
- ☐ **C.** Applying chest compression
- ☐ **D.** Administrating adrenalin

7) At which stage of the disaster cycle should medical equipment and essentials be stocked?

- ☐ **A.** Preparation
- ☐ **B.** Damage reduction
- ☐ **C.** Intervention
- ☐ **D.** Improving

8) Which of the following public health practices is correct after a disaster?

- ☐ **A.** After a disaster, temporary toilets should be installed against the wind near water sources.
- ☐ **B.** The nutritional needs of children, pregnant women, and breastfeeding mothers are the same as for other disaster victims.
- ☐ **C.** Water resources likes streams, lakes, or dams can be used to meet the water needs of disaster victims during nuclear disasters.
- ☐ **D.** Boiling or chlorination of water can be used for disinfection of water in disasters.

9) Which of the following is not true about infectious diseases that can develop after disasters?

- ☐ **A.** Encouraging disaster victims to wash their hands and use soap is one of the most important steps for preventing fecal-oral infections.
- ☐ **B.** Insecticide spraying and insecticide-treated nets can be used to protect indoor environments from vectors.
- ☐ **C.** The bodies of those who died during disasters are one of the main causes of the emergence of infectious diseases.
- ☐ **D.** Post-traumatic wound care, tetanus prophylaxis and use of anti-inflammatory medication are important to prevent post-traumatic diseases.

10) You are assigned to an earthquake disaster region with a lot of debris. During the ongoing search and rescue operations of a 10-story wrecked building, an injured person whose right half of their body is trapped under a column was found. The person was male, 34 years old, and conscious, with TA: 113/65 mmHg, Pp: 108 /minutes, SD: 24 /minute Sat: 94%. The search and rescue personnel reported that the rescue operation would continue for at least 1.5 hours. How would you handle this patient at the scene?

- ☐ **A.** I would only give him oxygen.
- ☐ **B.** I would start a fluid treatment by opening a wide vascular access.
- ☐ **C.** I would wait for the patient to be rescued from the wreckage.
- ☐ **D.** I do not know.

11) A 42-year-old woman, who was among the victims of a fire that occurred in a large area and caused the death of 83 people, started to suffer two weeks after the fire from anorexia, sleeping disorder, palpitations, loss of energy, and recurring images of the fire in her mind. These conditions had been ongoing for two months. Which of the following is the most probable diagnosis for this patient?

- ☐ **A.** Acute stress disorder
- ☐ **B.** Panic disorder
- ☐ **C.** Dissociative disorder
- ☐ D. Post-traumatic stress disorder

12) Which of the following should not be said or done by post-disaster psychological first-aid care providers?

- ☐ **A.** Respect privacy.
- ☐ **B.** Provide accurate information
- ☐ **C.** React to the feelings of a person with statements such as "you should not feel like this" or "you should feel lucky to be alive".
- ☐ **D.** Show that you understand a person's feelings and losses and important events they talk about with a statement such as, "I am so sorry, I can only imagine how painful this is for you."

13) Which of the following is not correct in the allocation of resources to be used in the case of a disaster?

- ☐ **A.** It should be transparent
- ☐ **B.** It should be proportionate
- ☐ **C.** It should vary based on individuals
- ☐ **D.** It should be consistent

14) A rig carrying a chemical load has an accident near your house when you are at home. The officials report that there is a chlorine gas leakage because of the accident. Which of the following is the first step of emergency response?

- ☐ **A.** I would remain in areas where there is an upwind
- ☐ **B.** If I am inside the house, I would close all doors, windows and openings.
- ☐ **C.** I would quickly consult the nearest emergency service.
- ☐ **D.** I have no knowledge about this subject.

15) You are assigned to provide and manage medical care for the injured after a flood. In which unit do you work in the incident management system according to this information?

- ☐ **A.** Logistics department
- ☐ **B.** Finance department
- ☐ **C.** Operations department
- ☐ **D.** Planning department

16) Press and public statements will be made by the relevant people about this flood. Which of the following is appropriate?

- ☐ **A.** The statements are made by any personnel whose workload is not excessive at the time
- ☐ **B.** Use easily understandable language that does not include medical terms
- ☐ **C.** Do not disclose the real number of losses
- ☐ **D.** Give detailed, technical information about the incident

17) Which of the following is correct for disaster management?

- ☐ **A.** Disaster management steps can only be applied in disasters occurring in urban areas.
- ☐ **B.** It includes the damage reduction, preparation, response, and recovery periods of disasters.
- ☐ **C.** Drills and training operations are included in the response period.
- ☐ **D.** Logistics management is not included in disaster management.

18) Which of the following is correct for trauma patients?

- ☐ **A.** Reduction of open fractures should be carried out at the scene of incidents.
- ☐ **B.** The first method to be used is the tourniquet application for the control of bleeding in extremities.
- ☐ **C.** For patients suspected of spinal fractures, complete spinal immobilization should be provided.
- ☐ **D.** If a cervical brace is used, it should be a soft one.

19) Which of the following includes oil spills, nuclear explosions, and bioterrorism?

- ☐ **A.** Natural disasters
- ☐ **B.** Hydroclimatological disasters
- ☐ **C.** Human-made disasters
- ☐ **D.** Social disasters

20) Which of the following constitutes legislation that determines the general framework of the provision of health services during disasters in Turkey?

- ☐ **A.** Emergency Health Services Regulation
- ☐ **B.** Hospital Disaster and Emergency Plan Regulation
- ☐ **C.** Ambulance Services Regulation
- ☐ **D.** Directive on Duties and Working Principles of Disaster Health Services Unit and National Medical Rescue Teams

21) Which of the following is correct for decontamination procedures?

- ☐ **A.** It is recommended to hold the head back during body wash.
- ☐ **B.** Basic and advanced life support practices should be carried out after the decontamination procedure is completed.
- ☐ **C.** In extremely cold climate conditions, dry decontamination alone is sufficient for decontamination procedure.
- ☐ **D.** Contaminated clothes should be removed by taking them off over the head.

22) Which of the following is not correct in terms of disaster communication principles?

- ☐ **A.** There is no designated frequency to be used during disasters by the Ministry of Health, so any frequency can be used for communication.
- ☐ **B.** For radio communication, communication should be conducted using the lowest possible power that allows communication.
- ☐ **C.** Radio conversations should be short, clear, and understandable.
- ☐ **D.** To start the transmission and make sure that the conversation is fully understood by the target station from the start, you should wait a brief moment (approximately for 3 sec.) after pressing the radio latch before starting to talk.

23) In the "START" triage method, when and by which method is the conscious state of patients evaluated?

- ☐ **A.** Before the circulation step, by asking the patient's name
- ☐ **B.** Before the respiration step, by asking the moment of the incident
- ☐ **C.** In the first encounter with the patient, by asking the month and day
- ☐ **D.** After the circulation step, by asking them to perform a simple instruction, such as "hold my hand"

24) Which of the following is not true about mass death management?

- ☐ **A.** Dead bodies can be stored for 6 months in areas with a temperature of 2.7-5.5 °C
- ☐ **B.** Except in rare cases, infectious microorganisms cannot survive longer than 48 hours in dead bodies.
- ☐ **C.** Most mass deaths occur in hospitals.
- ☐ **D.** In cases when the morgue and storage capacities are exceeded, temporary underground burials can be performed.

25) Which of the following methods can be used to minimize unwanted radioactivity exposure and related damage?

- ☐ **A.** Taking oral iodine tablets
- ☐ B. Using personal protective equipment
- ☐ **C.** Shortening the exposure time, increasing the distance from the source, and covering the source
- ☐ **D.** Applying decontamination procedures multiple times

3. EDUCATIONAL APPROACH TOWARD DISASTER MEDICINE

1) How do you think disaster medicine education should be administered?
You can mark multiple options.

- ☐ **A.** Classical classroom lectures/lecture presentations
- ☐ **B.** Video conferencing
- ☐ **C.** Video, podcast
- ☐ **D.** Online web-based courses
- ☐ **E.** Individual textbooks, brochures
- ☐ **F.** I have no idea.

2) What do you think the duration of disaster medicine education should be?

- ☐ **A.** An academic term or a specifically designated period
- ☐ **B.** 3-5 days of workshops/conferences before graduation
- ☐ **C.** Two hours a week during the final academic year
- ☐ **D.** Other. Please explain. .....

3) Which branch should provide disaster medicine education?

- ☐ **A.** Emergency medicine
- ☐ **B.** Family practice
- ☐ **C.** Public health
- ☐ **D.** Any clinical branch
- ☐ **E.** I have no idea.

4) How would you evaluate your personal knowledge level on a scale of 0-10 (from the lowest to the highest) in each of the following situations?

- ☐ **A.** Chemical incidents
- ☐ B. Biological incidents
- ☐ **C.** Radiological incidents
- ☐ **D.** Nuclear incidents
- ☐ **E.** Natural disasters
- ☐ F. Epidemics

5) How would you evaluate your personal knowledge level on a scale of 0-10 scale (from the lowest to the highest) about giving medical attention in each of the following situations?

- ☐ **A.** Chemical incidents
- ☐ **B.** Biological incidents
- ☐ **C.** Radiological incidents
- ☐ **D.** Nuclear incidents
- ☐ **E.** Natural disasters
- ☐ **F.** Epidemics

6) About which of the following subjects would you like to receive disaster medicine educational training?

- ☐ **A.** Fundamental principles of disaster aid
- ☐ **B.** Treatment principles and first-aid skills
- ☐ **C.** Rescuing and transport of the injured
- ☐ **D.** Incident scene triage
- ☐ **E.** Hospital disaster preparations and roles of hospitals in disasters
- ☐ **F.** Roles of field hospitals in disasters
- ☐ **G.** Traffic accidents
- ☐ **H.** Earthquakes
- ☐ **I.** Mine accidents
- ☐ **J.** Terrorist attacks
- ☐ **K.** Mass poisoning
- ☐ **L.** Floods, typhoons, tsunamis, winter storms, famine, desertification
- ☐ **M.** Subway and tunnel accidents
- ☐ **N.** Fires
- ☐ **O.** Chemical accidents
- ☐ **P.** Nuclear accidents and radiation accidents
- ☐ **Q.** Legal issues regarding disaster relief
- ☐ **R.** Medical problems in disasters
- ☐ **S.** Psychological aid after disasters
- ☐ **T.** Epidemic prevention after disasters
- ☐ **U.** Disaster epidemiology
- ☐ **V.** Public health in disasters
- ☐ **W.** National and local disaster reduction plans and preparation for disasters
- ☐ **X.** Humanitarian assistance in disasters