

## Knowledge, Attitude, and Readiness to Practice Disaster Preparedness among University Health Students: Insights from Resource-Poor Setting

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**Abstract:** University health students as future healthcare personnel need to be prepared to play a vital role in disaster management. Therefore, knowledge, skills, and training in emergencies and disasters are imperative for effective responses. However, their knowledge, attitude, and readiness to practice levels of disaster medicine are not well studied in Yemen. This study aimed to evaluate the current knowledge, attitude, and readiness to practice (KArP) regarding disaster medicine management and preparedness among Yemeni health students. A cross-sectional study was conducted among health students at Aden University. A validated structured questionnaire on the KArP level of disaster medicine was used in the survey. In addition to descriptive statistics, parametric tests (independent t-tests, one-way ANOVA, two-way ANOVA, Pearson correlation, and multiple regression analysis) or nonparametric tests were used when appropriate. P-values of < 0.05 were considered statistically significant. Two hundred fifty health students participated in this study. The levels of knowledge, attitude, and readiness to practice were moderate. Knowledge and attitude levels are significantly correlated and predict readiness to practice. The levels of knowledge, positive attitude, and readiness to practice among the healthcare students regarding disaster management and preparedness were moderate, i.e., far from highly satisfactory. Novelty/Improvement: This study provides insight into the importance of including disaster management education and training in university curricula.

**Keywords:** disaster medicine, health professional students, knowledge, attitude, readiness to practice.

### 大學健康學生的知識、態度和實踐備災準備：來自資源貧乏環境的見解

**摘要：**大學健康專業的學生作為未來的醫療保健人員，需要準備好在災難管理中發揮重要作用。因此，緊急情況和災害中的知識、技能和培訓對於有效應對至關重要。然而，他們的知識、態度和實踐災害醫學水平的準備程度在也門並未得到很好的研究。本研究旨在評估也門健康學生在災害醫學管理和準備方面的當前知識、態度和實踐準備。在亞丁大學的健康學生中進行了一項橫斷面研究。調查中使用了一份經過驗證的關於災害醫學知識、態度和實踐意願水平的結構化問卷。除了描述性統計，參數檢驗（獨立t檢驗、單因素方差分析、雙向方差分析、皮爾遜相關和

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多元回歸分析) 或非參數檢驗在適當的時候被使用。 $<0.05$ 的P值被認為具有統計學意義。250名健康學生參加了這項研究。知識、態度和實踐準備程度適中。知識和態度水平顯著相關, 可以預測實踐的準備程度。醫療保健學生在災害管理和準備方面的知識水平、積極態度和實踐準備程度中等, 即遠不能令人滿意。新穎性/改進: 本研究深入了解了將災害管理教育和培訓納入大學課程的重要性。

**关键词:** 災害醫學、健康專業的學生、知識、態度、實踐準備。

## 1. Introduction

Over the last decade, the frequency of disasters and losses has increased significantly [1, 2]. The World Health Organization defines the term disaster as “an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community” [3]. According to the JCAHCO, “a disaster is an imbalance in the availability of medical care and the maldistribution of medical resources that results in casualties within a community” [4].

Yemen is currently undergoing one of the most challenging periods in its history. Since the war in 2015, it has faced several man-made and natural disasters. Disasters are part of Yemeni people's life. The streets are not safe, and there have been several terrorist incidents almost every week, along with civil conflicts and ongoing war [5]. Cholera epidemic outbreaks occurred in 2016 and 2018, with a death rate of 0.22% [6, 7]. The expansion of the war has led to the emigration of many families, economic crises, and famine [8]. According to the 2019 INFORM risk index, Yemen had a risk index of 7.8 of 10 [9].

Disaster preparedness is essential for overcoming an emergency [10]. Disaster preparedness is defined as “measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences” [11]. All Yemeni people should have the knowledge and training to respond to disasters and at least offer first aid to help sufferers. In disasters, health centers are the first destination where victims seek care. The responsibility of health professionals and health-related science students is greater, and they should have enough knowledge, attitude, and training to support and save the lives of victims. These students should have the ability to effectively manage the situation and have enough skills and preparedness to cope with disasters,

e.g., as volunteers or as frontline respondents when they become healthcare professionals [12]. Despite the ongoing emergencies encountered in almost all cities in Yemen, there is a deficiency in disaster preparedness and training programs among health professionals, as reported in previous studies [13-15]. Health-related science students are key future health professionals, and the provision of sufficient knowledge and the development of training programs are essential components in maintaining the preparedness and capabilities of these future health care staff to cope with disasters. Specifically, we aimed to test the following hypotheses:

1. The higher the knowledge level of students regarding disaster management was, the more positive their attitudes were toward it;
2. The more positive students' attitudes to disaster management, the higher their readiness to practice;
3. Both knowledge and attitudes toward disaster management are drivers of readiness to practice.

The current study was conducted to evaluate the knowledge (K), attitude (A), and readiness to practice (rP) among health-related science college students. This study will provide insights supporting the development of a proper educational program and training to manage the ongoing disasters in Yemen.

## 2. Methods

### 2.1. Study Design

A cross-sectional study was carried out at Aden University, a public university in Yemen, from January to October 2019. A survey was carried out among healthcare students to assess their levels of KArP.

### 2.2. Ethical Considerations

The Ethics Research Committee approved this study of the Faculty of Medicine and Health Sciences, Aden University. All respondents were required to offer written

informed consent after being told that participation was voluntary and that it was possible to withdraw without notice and after being told the research's objectives, importance, and benefits. All survey forms were anonymous. After approval was granted, the head of departments was contacted.

### 2.3. Study Population and Sample Size

The study population was composed of health students from the Departments of Medicine, Dentistry, Nursing, Laboratory Sciences, and Pharmacy. In addition, students at the undergraduate level and registered in health-related colleges/departments were eligible for the study. The required sample size was calculated using Raosoft® (<http://www.raosoft.com/samplesize.html>) based on a margin of error of 5%, a 95% confidence level, and an 80% response distribution.

### 2.4. Study Questionnaire Development and Validity Measures

A structured questionnaire was adapted from a previously published study [16]. The questionnaire was translated into Arabic. It was validated and pretested to ensure reliability and validity prior to the initiation of the fieldwork. The study instrument involved the three primary domains: knowledge, attitude, and readiness to practice. In our study context, knowledge is defined as "information and skills related to disaster management and preparedness obtained through education or experience." Attitude is defined as "readiness of the mind to act in a certain way concerning disaster management and preparedness activities." Practice readiness is defined as "the individuals having the necessary knowledge, required skills and willingness to perform their role and responsibility if disasters were to happen." The knowledge section includes 22 close-ended binary questions (yes/no answer), ranging between 0–22 points. The attitude section is composed of 16 questions on a 5-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree), with a minimum of 16 and a maximum of 80 points. The readiness to practice section consists of 11 questions on a five-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree). The total score ranges between 11 and 55 points. Negatively structured questions were reversed during the analysis. The KArP scores were classified as low, moderate, and high using the following cutoffs: low (below 25%), moderate (25-75%), and high score (higher than 75%). The Cronbach's alphas are K = 0.719, A = 0.787, rP = 0.691, and KArP = 0.670.

### 2.5. Data Collection

After obtaining written permission from all the HODs and consent from the participants, the pretested paper-based questionnaire was conveniently distributed to the students. The students were given 7 to 14 days to complete the survey form.

### 2.6. Statistical Analysis

The data collected for this study were analyzed using the Statistical Package for the Social Sciences v18 (SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc.). The data were cleaned and thoroughly checked to ensure the accuracy of entries before the analysis initiation. The demographic and socioeconomic characteristics of the respondents are presented as percentages and frequencies. K, A, rP, and total KArP scores were measured as the mean (sd). A Kolmogorov-Smirnov normality test was performed to confirm a normal distribution. When appropriate, independent t-tests, one-way ANOVA, two-way ANOVA, Pearson correlation, and multiple regression analysis or nonparametric tests were used. A p-value of less than 0.05 was considered to be significant.

## 3. Results

The demographic characteristics indicated that approximately 250 questionnaires were distributed among the students of the health-related science faculties of Medicine, Pharmacy, Dentistry, Medical Laboratory, and Nursing. Most of the participants were male (n=150, 60%), and approximately 100 (40%) were female. The age of the students ranged from 19-30 years old, with an average of 22.25±1.45. The study majors were distributed equally between the colleges.

Table 1 General socio-demographic characteristics of the study population (N = 250)

Variable	Frequency	%
<b>Gender</b>		
Male	150	60.0
Female	100	40.0
<b>Study Major</b>		
Medicine	50	20.0
Pharmacy	50	20.0
Dentistry	50	20.0
Medical laboratory	50	20.0
Nursing	50	20.0
<b>Academic Year</b>		
1 <sup>st</sup> Year	3	1.2
2 <sup>nd</sup> Year	94	37.6
3 <sup>rd</sup> Year	57	22.8
4 <sup>th</sup> Year	86	34.4
5 <sup>th</sup> Year	10	4.0

Most of the participants were in the second and fourth academic years (37.6% and 34.4%, respectively). The demographic characteristics of the study participants are represented in Table 1.

The results in relation to the influence of gender, study major and academic years on K, A, rP and KArP scores are shown in Table 2. There was no significant effect of gender, despite females attaining higher scores

than males for knowledge ( $p=0.142$ ), attitude ( $p=0.791$ ) and total KArP ( $p=0.151$ ). Compared the 100 female students who responded to the readiness to practice questions ( $M = 28.82$ ,  $SD = 4.66$ ), the 148 male students ( $M = 26.93$ ,  $SD = 5.27$ ) demonstrated significantly higher scores ( $t(248) = 2.902$ ,  $p = .004$ ; 95% CI: 0.606 – 3.167).

Table 2 KArP scores based on the respondents' demographics and educational profiles (n = 250)

Variable	N	K score (Mean±S.D)	A score (Mean±S.D)	Rp score (Mean±S.D)	KArP score (Mean±S.D)
<b>Gender</b>					
Male	148	32.45 ±3.92	35.19± 8.37	26.93±5.27	94.88±14.49
Female	100	33.19±3.79	35.47± 8.14	28.82±4.66	97.48±13.02
p-value		0.142	0.791	0.004	0.151
<b>Degree Major</b>					
Medicine (M)	50	32.58±3.71	35.48±9.47	26.06±5.76	95.52±16.05
Pharmacy (P)	50	30.58±4.60	34.86±6.33	27.08±4.61	92.52±11.67
Dentistry (D)	50	33.86±3.11	36.68±8.18	28.18±5.03	98.72±13.39
Laboratory (L)	50	33.94±3.59	38.46±8.40	29.88±4.47	102.28±13.30
Nursing (N)	50	32.78±3.36	31.02±7.00	27.69±4.96	91.04±12.46
p value		0.000	0.000	0.003	0.000
<b>Academic Year</b>					
1 <sup>st</sup> Year	3	29.67±1.53	34.00±6.08	25.33±3.76	89.00±9.85
2 <sup>nd</sup> Year	94	32.56±3.21	34.18±8.18	27.28±4.94	94.02±13.33
3 <sup>rd</sup> Year	57	32.60±4.29	35.54±9.15	27.32±5.26	95.46±15.73
4 <sup>th</sup> Year	86	33.64±3.87	36.87±7.75	28.33±5.02	99.46±12.54
5 <sup>th</sup> Year	10	28.8±4.94	31.30±6.77	28.90±6.87	89.00±16.36
p-value		0.002	0.120	0.488	0.032

Notes: Tukey HSD multiple comparisons test was conducted for each of the one-way ANOVA significant result.

(1) Degree major. Knowledge: P-D, P-L, P-N; Attitude: M-N, D-N, N-L; Readiness to practice: P-L, M-L; Total KArP: P-L, D-N, L-N. (2) Academic year Knowledge: 2-5, 3-5, 4-5; Total KArP: 1-4, 4-5

One-way ANOVA was conducted to assess the significant differences by study major and academic year of the students for K, A, rP, and total KArP. Students' study major significantly differed in all the study domains – K, A, rP, and total KArP. However, the academic year was proven significant only for K and total KArP. Furthermore, Tukey's HSD multiple comparisons test was performed for all significant one-way ANOVA tests.

A two-way ANOVA was conducted to examine the effect of gender and study major on knowledge, attitude, and readiness to practice. There were no significant interactions between gender and study major effects on knowledge and attitude. However, there was a significant interaction between gender and study major effects on readiness to practice,  $F(4, 240) = 2.790$ ,  $p = .027$ .

The correlation between the studied domains was analyzed using Pearson correlation, as illustrated in Table 3. The results indicated a highly significant moderate correlation between knowledge and the other two domains, i.e., attitude ( $r=0.425$ ) and readiness to practice ( $r = 0.390$ ); in addition, there was a highly significant positive correlation with the overall KArP scores ( $r = 0.669$ ). The attitude was also found to be highly significantly correlated with readiness to practice ( $r = 0.549$ ). Moreover, the attitude score had a relatively high positive correlation ( $r=0.90$ ) with the overall KArP scores. The correlation between the readiness to practice score and overall KArP scores was considerably high and highly significant ( $r = 0.787$ ).

Table 3 Association between knowledge, attitude, and readiness to practice scores among study population

		Knowledge	Attitude	Readiness to practice	KArP
Knowledge	Pearson correlation		.425**	.390**	.669**
	p-value		.000	.000	.000
	n		248	248	248
Attitude	Pearson correlation			.549**	.900**

Continuation of Table 3

	p-value	.000	.000
	n	250	248
Readiness to practice	Pearson correlation		.787**
	p-value		.000
	n		248

Note: Correlation is significant at 0.01 \*\* level (2-tailed).

Multiple regression analysis was carried out based on the above significant positive correlations. A multiple regression was run to predict rP from K and A. These variables significantly predicted rP ( $F(2, 245) = 57.887$ ,  $p < 0.000$ ,  $R^2 = 0.321$ ). The knowledge and attitude factors contributed only 32% to the two variables added and were significant to the prediction,  $p < 0.05$ .

The regression model is as follows:

$$rP = 0.281 (A) + 0.258 (K) + 9.346$$

#### 4. Discussion

Our study examined the current knowledge, attitude, and readiness to practice (KArP) in disaster medicine management and preparedness among Yemeni healthcare students at Aden University. The average K, A, rP and total KArP scores of the students were moderate. Students' knowledge and attitude toward disaster management and preparedness were significantly correlated and were predictors of their readiness to practice. Similar findings were observed among students in Qatar, Pakistan, and China [16, 17]. Knowledge and attitude are significant drivers of a positive readiness to practice. Fabrigar et al. [18] demonstrated that people consider the behavioral relevance and dimensional complexity of their attitudes' knowledge before deciding to act on them. A positive relationship between K, A, and rP encourages educators to establish better curricula and training programs to educate and prepare healthcare students for disaster management and preparedness.

Given the observation of the United Nations that Yemen is currently facing the largest humanitarian disaster in the world [19], precautions should be taken for any emergency disaster. Students are a helpful workforce or volunteer force in disaster circumstances. Volunteerism is an essential demonstration of human relations [20]. Students in healthcare should have sufficient knowledge about the basic strategies for proper management during times of disaster. In addition to medical students, other healthcare professionals have the general medical knowledge and clinical skills to assist as volunteers. As future healthcare personnel, individuals working as nurses, pharmacists, dentists, and laboratory technicians can increase the capacity of response teams. According to Murphy et al. [21], nurses' knowledge, skills, and abilities during disaster and emergency events

can significantly impact treatment and patient outcomes. Thus, appropriate training is required when students are at university. As the first step to creating a new generation of students aware of disaster risks and how to cope with them, this study was conducted to assess the current status of knowledge, attitudes, and practices of disaster preparedness among university students in health-related science faculties. According to the Hyogo Framework for Action 2005-2015, disaster education aims 'to build a culture of safety and resilience at all levels' to reduce disaster risks' social and economic influences. According to previous studies, education is essential for developing effective preparedness among university students, and disaster preparedness should be a critical element of the college curriculum [22, 23]. The content in the syllabus and training must range across the field of disaster management, from prevention to preparedness and mitigation and response and recovery [20].

The surveyed students had relatively moderate KArP, which is worrisome, especially in a country suffering from a chain of consecutive disasters. The results indicated no significant difference in terms of KArP level between genders. These results are similar to those of other studies conducted among university students in different countries [16, 17]. The findings revealed that the 1<sup>st</sup>-year and 5<sup>th</sup>-year academic students had superficial KArP, while the 2<sup>nd</sup>- and 4<sup>th</sup>-year students had the highest percentage of KArP (94, 86%). This finding may be due to the involvement of 2<sup>nd</sup>- and 4<sup>th</sup>-year students in recent MSF (Médecins Sans Frontiers) and IRC (International Red Cross) disaster awareness campaigns. Students in the 1<sup>st</sup> year may not have sufficient awareness about disaster hazards, and students in the 5<sup>th</sup> year may have less enthusiasm for participating in activities outside the classroom. This finding insists on including disaster education courses in the university curriculum, supported by disaster drills and rescue skills. Disaster preparedness should be based on education courses and periodic disaster drills. Several studies have revealed the positive impact of incorporating these courses into the curriculum of colleges of medicine [24, 25], pharmacy [26], emergency medicine, public health, and disaster management [27]. The syllabus substantially influences students' general knowledge and readiness to learn. Another study indicated the efficiency of an

extracurricular training program in enhancing medical students' knowledge to cope with disasters [28].

The knowledge, attitude, and readiness levels were moderate, with a higher level presented by attitude. Moreover, there was a positive correlation between attitude and overall KArP. Even students with a relatively low level of knowledge showed a slightly more positive attitude toward dealing with disasters; i.e., the students were willing to deal with disaster situations if they had sufficient knowledge and training that may also represent a positive indication of the willingness to be involved in education and training programs. As mentioned above, attitude is a factor influencing behavior. According to Kim and Hunter [29], the higher the attitudinal relevance is, the stronger the relationship between attitude and behavior (i.e., readiness to practice). College curricula can include knowledge aspects relating to what, how, when, and why in terms of disaster management [30]. According to Ajzen & Fishbein (1977) and Beavers et al. (1982), knowledge and attitude are not strong predictors of behavior alone; they can sometimes be reciprocal, and other factors can contribute to the relationship [31]. As the regression model illustrated, 68% of the variance was unexplained. Thus, future studies should consider other determinants of readiness to practice among students (i.e., behavior).

#### 4.1. Study Strengths and Limitations

The study was carried out only in one university and one geographical area. We are restricted from moving to other areas due to the unstable and insecure conditions in the country. Furthermore, the study applied a nonrandom sampling method and a small sample size, which might affect the generalizability of the findings. However, the scope and objective of the study are unique, and we have created a good basis for wider and in-depth studies.

#### 4.2. Implications and Explanation

As mentioned above, Yemen is a hotspot for disasters. Educational programs should be intended for university students and the public, primary school students, and secondary school students for future capacity building. Notably, health-related science students' abilities to acquire knowledge and skills to save lives and work under high pressure are greater than those of other populations. The findings of this study provide evidence for educators and leaders in the educational setting to focus on curriculum development and training in disaster management and preparedness among university students.

## 5. Conclusion and Recommendations

According to this study, it can be concluded that students had insufficient knowledge and appropriate satisfactory levels of attitude and readiness to practice disaster preparedness. This study provides insight into the importance of including disaster safety education and training in university curricula, especially in resource-poor settings. First, emergency management courses should be integrated into the curriculum to equip students to cope with disasters. Courses should be available after graduation and in continuing medical education programs. These courses should be developed by disaster management experts to enhance awareness and to provide effective education and training programs. In addition, disaster drills should be carried out periodically in universities, and updated information should be provided to enhance preparedness and mitigation efforts. Secondly, educational authorities should cooperate with the concerned agencies to elevate awareness among students and educators. Furthermore, there should be cooperation between the Yemeni government, Civil Defense, and universities to establish a disaster preparedness educational plan. Thirdly, additional research is required to identify the best teaching models and approaches for students when confronted with disasters. All these initiatives will eventually enhance capacity-building preparedness and reduce the number of emergency deaths.

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