Should We Focus More on Teaching and Training Disaster Management in Health-care Colleges? An Insight into the Students’ Knowledge, Attitude, and Readiness to Practice

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Abstract

Background: The critical aspects of risk management for students are providing knowledge, building positive attitudes, and readiness to practice. Our study aimed to assess Chinese health-care university students’ knowledge (K), attitude (A), and readiness to practice (rP) regarding disaster medicine and preparedness. Materials and Methods: A survey was carried out using a self-administered disaster medicine and preparedness questionnaire. Three main outcome measures were K (22 items), A (16 items), and rP (11 items). Responses were scored and classified as high, moderate, and low. Descriptive and inferential statistics were performed for data analysis. Results: A total of 769 valid questionnaires were collected. The associations between K, A, and rP scores were significant, i.e., K–A scores (r = 0.449, P = 0.000), K–rP scores (r = 0.312, P = 0.000), and A–rP scores (r = 0.656, P = 0.000). Multiple linear regression analysis indicated direct low-to-moderate effects of gender, age, attitude, and knowledge on readiness to practice (R² = 0.198; P < 0.001). Conclusions: The study discovered that most of the students had a moderate level of knowledge, moderate level of attitude, high level of readiness to practice, and a moderate level of total KArP. K, A, and rP were significantly correlated, and K and A were predictors for rP among the health-care students. The findings indicate the importance of health-care colleges for building students’ knowledge, attitudes, and readiness to practice disaster medicine and preparedness before joining the profession.

Keywords: Attitude, China, disaster medicine, health-care university students, knowledge, readiness to practice

Introduction

A disaster can cause widespread loss of human life, material, economic, or environmental factors, seriously disrupting a community or society.[1] Over the past few decades, the intensity and occurrence of natural and man-made disasters have increased worldwide. Public health emergencies, earthquakes, hurricanes, fires, floods, nuclear leakage, biological terrorism, and other disasters directly threaten the life and development of the community.[2,4] Coronavirus disease-2019 (COVID-19) is an excellent example of such a disaster. As of January 27, 2021, there have been approximately 101 million confirmed cases of COVID-19, including 2.2 million deaths.[5] After the outbreak, China took comprehensive and strict measures to control the virus.[6] Health-care professionals’ responsibility is to promote, safeguard, and improve the health of the people. In addition, their role is to prevent harmful outcomes, especially in vulnerable populations. Therefore, disaster management education is very important to health-care students, who later will serve as health-care professionals.

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China is a country with a large population and is vulnerable to disasters.\textsuperscript{[3]} In 2003, the severe acute respiratory syndrome outbreak occurred, another serious epidemic disease, with more than 8000 cases, 774 deaths, and a 7% case-fatality rate.\textsuperscript{[7]} In recent decades, several major earthquakes have affected China. The 1976 Tangshan earthquake caused more than 240,000 lives and was the deadliest earthquake in the 20\textsuperscript{th} century.\textsuperscript{[8]} The 2008 Wenchuan earthquake caused 69,227 deaths and 374,643 injuries and resulted in 7,923 missing people.\textsuperscript{[9]} The 2010 Yushu earthquake caused 2698 deaths and 12,000 injuries, and 270 people were missing.\textsuperscript{[10]} Other types of disasters – fires, floods, accidents, and terrorist attacks – also occur regularly and cause many injuries and deaths.\textsuperscript{[3]} To lessen the harmful impacts of disasters, China should strengthen its disaster management capacities, particularly preparedness, response, and recovery.

The public is easily affected by disasters. Self-rescue and support are important in forming the first defense line.\textsuperscript{[11‑13]} Health professionals are mainly responsible for disaster risk management and relief.\textsuperscript{[13‑15]} Disaster medicine preparedness education and training are integral parts of efficient disaster preparedness and risk reduction and can improve public awareness of disaster prevention and reduction; furthermore, they are vital for developing health professionals’ comprehensive skills.\textsuperscript{[12‑16]} Since the September 11, 2001, terrorist attacks, many countries have emphasized disaster medicine preparedness education and research on resilience.\textsuperscript{[2]} University health-care profession students are future health-care providers and members of the community. As future health-care professionals, adequate knowledge, positive attitudes, and readiness to practice must be acquired at the university level to enhance their skills. As members of society with high levels of disaster preparedness and risk management, they will help and educate others with their knowledge.\textsuperscript{[13,16]} Disaster medicine preparedness education programs focus on developing particular small-scale training programs, such as short-term training courses of disasters, psychosocial training programs, and emergency preparedness training programs.\textsuperscript{[13]} Health and medical education and assessment criteria in colleges have been largely clinically oriented; however, disaster medicine preparedness has not been emphasized.\textsuperscript{[17]}

Previous studies in many countries found that health professional students had low levels of disaster preparedness concerning disaster management.\textsuperscript{[18‑20]} Lack of education, training activities, and experience with disasters have led to low levels of knowledge and response to disaster preparedness.\textsuperscript{[18‑20]} The same results were also found in China. Insufficient knowledge and low levels of preparedness were found among community residents, health professionals, and university students.\textsuperscript{[11‑13,16,21,22]} To our knowledge, more studies have focused on disaster preparedness among health-care students in developed nations. However, there was a lack of reports that comprehensively analyzed health-care students’ knowledge, attitudes, and readiness to practice regarding disaster medicine and preparedness in low- and middle-income countries. Their knowledge and attitude toward emergencies reflect their levels of theoretical knowledge and their beliefs. Knowledge, attitude, and readiness to practice affect their response capacity.\textsuperscript{[22,23]}

In our study, we aimed to assess health-care students’ knowledge (K), attitude (A), and readiness to practice (rP) regarding disaster medicine and preparedness in China and to evaluate the level of disaster medicine preparedness among them. After understanding the status, we can make recommendations to provide them with appropriate training and education to improve the ability of future health-care staff to respond to disasters.

**Materials and Methods**

**Study design and participants**

An observational cross-sectional study was conducted among health-care students of Xi’an Jiaotong University. All Xi’an Jiaotong University Health Science Center undergraduates were included in the research with no restrictions on age, gender, or study level/academic year. Students from postgraduate levels and nonhealth-care students were excluded from the study. The data were collected both electronically and from paper-based media. In the beginning, the data were collected via a paper-based questionnaire, but due to vacation occurring during the study period, data collection was continued electronically. The electronic questionnaire was sent to the undergraduate WeChat group through their teachers, and the students completed the questionnaire voluntarily. Data were collected between December 22, 2019, and January 27, 2020.

**Ethical considerations**

Our study protocol received ethics approval from the Biomedical Ethics Committee for Medical Research of Xi’an Jiaotong University (Approval no: 2020-1184). Participants were informed that all of the data gathered would be handled with complete confidentiality and used only for research purposes. The participants were all voluntary participants and could withdraw at any time. No names were identified on the questionnaires. The researchers only used codes on the forms and analysis; thus, the data could not be linked to the participants.
Tool development

Questionnaire development was based on a review of the literature. A prevalidated questionnaire was previously used in two studies in Qatar and Pakistan.20,24 Study tools involved the three primary domains of knowledge, attitude, and readiness to practice, with participants’ demographics in a separate domain. We defined readiness to practice as “the individuals having the necessary knowledge, required skills and sensible decisions that are needed to perform their role and responsibility in disaster management and preparedness.” Part 1 was on knowledge, including 22 close-ended binary questions (yes/no answer), with scores ranging between 0 and 22 points. Part 2, the attitude section, had 16 Likert scale questions (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree), and scores could have a minimum of 16 and a maximum of 80 points. The readiness to practice section consisted of 11 Likert scale questions (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree), with scores ranging between 11 and 55 points. Questions that were in negative statements were reversed for the analysis. To categorize the points for all K, A, rP, and KArP, cutoffs were set as follows: low score (below the 25th percentile), average score (between 25th and 75th percentiles), and high score (more than the 75th percentile). Cronbach’s alpha for the final tool was K = 0.685, A = 0.860, rP = 0.767, and overall KArP = 0.830.

Data analysis

SPSS V-26 (IBM Corp. Released 2018. IBM SPSS Statistics for Windows, Version 26.0 Armonk, NY, USA: IBM Corp.) was used to analyze the data. Data normality was checked using the Kolmogorov–Smirnov test. Descriptive analysis was applied; frequency (%) for noncontinuous variables and mean (standard deviation [SD]) or median (interquartile range [IQR]) for continuous variables were used. Kruskal–Wallis and Mann–Whitney tests were used to compare means. The Chi-square test was used for categorical data analysis. Spearman’s rho correlation test was carried out to examine the relationship between the three parameters (i.e., K, A, and rP). Multiple linear regression was performed to predict readiness to practice (dependent variable) based on gender, age, knowledge, and attitude (independent variables). All tests were carried out at an a priori alpha level of 0.05.

Results

The profiles of the respondents are shown in Table 1. The median age was 19.0 (IQR = 18.0–20.0) and ranged from 17 to 25. There were slightly more female respondents than male respondents. The majority of the respondents (60%, n = 457) were from the College of Medicine and in the first year of their academic program.

Table 2 illustrates the knowledge of the respondents regarding disaster medicine preparedness. The mean (SD) was 10.5 (3.3.), the median was 10.0 (IQR = 8.0–12.0), and the scores ranged from 4.0 to 21.0.

The majority of the respondents said “No” to 12 out of 22 items. Out of 22 items, approximately four-fifth of the respondents said “Yes” on 5 items: I think China is at risk of disasters (natural or human-made); Disasters come in many shapes and sizes; I am aware of what the potential risk emergencies in this country are (e.g., natural disaster, embargo, terror, war); Realistic on-scene training is vital to an efficient and effective disaster medicine plan; and Disaster medicine is truly a systems-oriented specialty and involves multiple responding agencies. Approximately four-fifth of the respondents said “No” to the following items: I have previous exposure to this topic (Disaster Medicine Preparedness); I have previous experience in dealing with disasters; Disaster medicine is the sole responsibility of pharmacy organizations; I read journal articles related to disaster medicine preparedness; I am familiar with the local emergency response system for disaster medicine; and I am familiar with the organizational logistics and roles among local and national agencies in disaster medicine response (i.e., making decisions and measures) situations. Out of the 22 items, the highest number of respondents (n = 712, 92.6%) were correct and agreed that disaster medicine is not the sole responsibility of pharmacy organizations.

| Item | Frequency (%) | Mean (SD) |
|------|---------------|-----------|
| Your age (years) | 19.5 (1.5) | |
| Gender | | |
| Male | 331 (43.0) | |
| Female | 438 (57.0) | |
| Degree major | | |
| Pharmacy | 95 (12.4) | |
| Medicine | 457 (59.4) | |
| Dental | 110 (14.3) | |
| Laboratory | 38 (4.9) | |
| Nursing | 69 (9.0) | |
| Academic level (year) | | |
| 1 | 288 (37.5) | |
| 2 | 178 (23.1) | |
| 3 | 194 (25.2) | |
| 4 | 85 (11.1) | |
| 5 | 24 (3.1) | |

SD: Standard deviation
Table 2: Knowledge assessment of the respondents

| Item                                                                 | Yes, n (%) | No, n (%) |
|----------------------------------------------------------------------|------------|-----------|
| 1. I have previous exposure to this topic (disaster medicine preparedness) | 165 (21.5) | 604 (78.5) |
| 2. I have previous experience in dealing with disasters              | 78 (10.1)  | 691 (89.9) |
| 3. I think China is at risk of disasters (natural or human-made)     | 715 (93.0) | 54 (7.0)  |
| 4. Disasters come in many shapes and sizes                          | 751 (97.7) | 18 (2.3)  |
| 5. Disaster medicine is the sole responsibility of pharmacy organizations | 57 (7.4)  | 712 (92.6) |
| 6. I read journal articles related to disaster medicine preparedness | 143 (18.6) | 626 (81.4) |
| 7. I am aware of classes about disaster medicine preparedness and management that are offered, for example, either at my college or in my community | 213 (27.7) | 556 (72.3) |
| 8. I find that the research literature on disaster medicine preparedness and management is not easily accessible | 461 (59.9) | 308 (40.1) |
| 9. I find that the research literature on disaster medicine preparedness is understandable | 484 (62.9) | 285 (37.1) |
| 10. Finding relevant information about disaster medicine preparedness related to this country’s needs is an obstacle to my level of preparedness | 487 (63.3) | 282 (36.7) |
| 11. I know where to find relevant research or information related to disaster medicine preparedness and management to fill in gaps in my knowledge | 294 (38.2) | 475 (61.8) |
| 12. I know referral contacts in case of a disaster medicine situation (e.g., health department) | 233 (30.3) | 536 (69.7) |
| 13. In case of a disaster medicine situation, I think that there is insufficient support from local officials on the governance level | 487 (63.3) | 282 (36.7) |
| 14. I am aware of what the potential risk emergencies in this country are (e.g., natural disaster, embargo, terror, war) | 648 (84.3) | 121 (15.7) |
| 15. I know how such emergencies or disasters can affect the medication supply system (selection, quantification, procurement, storage, distribution) | 252 (32.8) | 517 (67.2) |
| 16. I know the limits of my knowledge, skills, and readiness as a university/medical student to act in disaster medicine situations, and I would know when I exceed them | 438 (57.0) | 331 (43.0) |
| 17. In case of the war, I know how to overcome the access to medicine problem to benefit my society | 215 (28.0) | 554 (72.0) |

Continued...

Table 2: Contd...

| Item                                                                 | Yes, n (%) | No, n (%) |
|----------------------------------------------------------------------|------------|-----------|
| 18. I am familiar with the local emergency response system for disaster medicine | 112 (14.6) | 657 (85.4) |
| 19. I am familiar with the accepted process of “examining problems to decide which ones are the most serious and must be dealt with first (triage principles)” used in disaster medicine situations | 207 (26.9) | 562 (73.1) |
| 20. I am familiar with the organizational logistics and roles among local and national agencies in disaster medicine response (i.e., making decisions and taking measures) situations | 156 (20.3) | 613 (79.7) |
| 21. Realistic on-scene training is vital to an efficient and effective disaster medicine plan | 666 (86.6) | 103 (13.4) |
| 22. Disaster medicine is truly a systems-oriented specialty and involves multiple responding agencies | 678 (88.2) | 91 (11.8) |

Table 3 shows the attitudinal levels of the respondents toward disaster medicine preparedness. In terms of the agreement, more than 50% of the respondents agreed (total of strongly agree and agree) that I would be willing to be a future member of a healthcare facility/team in a disaster medicine situation (83.1%); I would be interested in educational classes on disaster medicine preparedness that relates specifically to the country’s situation (81.3%); I need more workshops and simulated training to be ready to deal with disaster medicine (80.6%); I would feel confident implementing emergency and disaster medicine plans and procedures (58.8%); As a University health or medical student, I would feel confident in my abilities as a future healthcare provider and first responder in a disaster medicine situation (58.3%); and I would not feel confident as a future manager or coordinator of a shelter/healthcare/medication supply facility (57.0%). In contrast, more than half of the respondents disagreed (combined of strongly disagree and disagree) with the following statements: I have personal/family emergency plans in place for disaster medicine situations (61.8%), and I have an agreement with loved ones and family members on how to execute our personal/family emergency and disaster medicine plans (53.2%).

Information regarding readiness to practice among respondents regarding disaster management and preparedness is described in Table 4. More than 50% of the respondents agreed (a total of strongly agree and agree) on the following statements: I am willing to attend the emergency medicine education incorporated
in the undergraduate coursework (84.3%); I need to be more trained on providing patient-centered care under a disaster medicine situation (79.5%); I am ready to practice under disaster conditions knowing that some basic medications may not be available because of the disaster situation (55.0%). For items related to barriers, the following items that the respondents highly agreed on included lack of knowledge about disaster medications; being unfamiliar with the new medications appearing during disasters (76.8%), and requiring effort and time to be prepared (84.9%). Conversely, 60.3% of the respondents disagreed (a combination of strongly disagree and disagree) that disaster medicine is unlikely to occur in China.

Table 5 illustrates the levels of knowledge, attitude, readiness to practice, and overall KArP scores (i.e., low, moderate, and high). The majority of the respondents had a moderate (scores between 8 and 12) level of knowledge ($n = 377$, 49.0%), a moderate (scores between 39 and 50) level of attitude ($n = 391$, 50.8%), a high (scores more than 32) level of readiness to practice, and a moderate (scores between 96 and 117) level of overall KArP ($n = 389$, 50.6%).

Using Spearman’s rho test, correlation analysis showed significant relationships between age and all K, A, rP, and overall KArP scores, but the correlations were all very weak [Table 6]. Gender was significantly different for the knowledge score (Mann–Whitney test, $P < 0.001$). Except for the rP score, other scores were significantly different between the major educational degrees of the respondents (Kruskal–Wallis test, $P < 0.05$). All the scores were significantly different (Kruskal–Wallis test, $P < 0.05$) between the academic level of the respondents. Spearman’s rho correlation was used to analyze the associations between K, A, and rP scores [Table 7]. All

| Item                                                                 | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|---------------------------------------------------------------------|----------------|-------|---------------------------|----------|------------------|
| 1. I consider myself prepared for the management of disaster medicine | 87 (11.3)      | 168 (21.8) | 266 (34.6) | 191 (24.8) | 57 (7.4) |
| 2. I would not feel confident in my abilities as a health-care student in a disaster medicine situation | 88 (11.4)      | 324 (42.1) | 216 (28.1) | 129 (16.8) | 12 (1.6) |
| 3. I would be interested in educational classes on disaster medicine preparedness that relate specifically to the country’s situation | 258 (33.6)     | 367 (47.7) | 121 (15.7) | 19 (2.5)   | 4 (0.5)  |
| 4. I would be considered a key leadership figure in my community in a disaster medicine situation | 71 (9.2)       | 138 (17.9) | 320 (41.6) | 188 (24.4) | 52 (6.8) |
| 5. I have personal/family emergency plans in place for disaster medicine situations | 34 (4.4)       | 49 (6.4)   | 211 (27.4) | 359 (46.7) | 116 (15.1) |
| 6. I have an agreement with loved ones and family members on how to execute our personal/family emergency and disaster medicine plans | 47 (6.1)       | 86 (11.2)  | 227 (29.5) | 307 (39.9) | 102 (13.3) |
| 7. I am able to describe my role in the response phase of disaster medicine in the context of my college, the general public, media, and personal contacts | 52 (6.8)       | 188 (24.4) | 318 (41.4) | 162 (21.1) | 49 (6.4)  |
| 8. I would not feel confident as a future manager or coordinator of a shelter/health care/medication supply facility | 83 (10.8)      | 355 (46.2) | 195 (25.4) | 126 (16.4) | 10 (1.3) |
| 9. I would be willing to be a future member of a health-care facility/team in case of a medical disaster | 244 (31.7)     | 395 (51.4) | 102 (13.3) | 18 (2.3)   | 10 (1.3) |
| 10. I feel reasonably confident I can care for patients independently without supervision of a physician in a disaster medicine situation | 73 (9.5)       | 258 (33.6) | 259 (33.7) | 147 (19.1) | 32 (4.2) |
| 11. I would feel confident implementing emergency and disaster medicine plans and procedures | 116 (15.1)     | 336 (43.7) | 213 (27.7) | 82 (10.7)  | 22 (2.9) |
| 12. I would feel confident in providing medicine-related education in case of disaster or emergency | 135 (17.6)     | 350 (45.5) | 192 (25.0) | 69 (9.0)   | 23 (3.0) |
| 13. As a university health or medical student, I consider myself prepared for the management of disaster medicine | 77 (10.0)      | 181 (23.5) | 269 (35.0) | 207 (26.9) | 35 (4.6) |
| 14. As a university health or medical student, I would feel confident in my abilities as a future health-care provider and first responder in a disaster medicine situation | 115 (15.0)     | 333 (43.3) | 202 (26.3) | 100 (13.0) | 19 (2.5) |
| 15 There is enough awareness on ways to stand wars and other humanity and natural emergencies among undergraduate students in university/medical college | 77 (10.0)      | 197 (25.6) | 275 (35.8) | 182 (23.7) | 38 (4.9) |
| 16. I need more workshops and simulated training to be ready to deal with disaster medicine | 218 (28.3)     | 402 (52.3) | 119 (15.5) | 18 (2.3)   | 12 (1.6) |
associations were significant, i.e. K-A scores ($r = 0.449$, $P = 0.000$), K-rP scores ($r = 0.312$, $P = 0.000$), and A-rP scores ($r = 0.656$, $P = 0.000$). In addition, multiple linear regression analysis indicated direct low-to-moderate effects of gender, age, attitude, and knowledge on readiness to practice, as shown in Equation 1 ($R^2 = 0.198$; $P < 0.001$). The regression equation estimated the level of readiness to practice as follows:

$$rP = (-0.074) \text{ gender} + (0.033) \text{ age} + (0.371) \text{ A} + (0.034) \text{ K} + (-0.091)$$

**Chi-square test – test of associations between knowledge, attitude, and readiness to practice scores**

The Chi-square test analyzed the associations between K, A, and readiness to practice score categories, i.e., low, moderate, and high. The findings indicated that there were significant associations between the knowledge and attitude ($\chi^2 = 107.52$, $P = 0.000$), knowledge and readiness to practice ($\chi^2 = 29.85$, $P = 0.000$), and attitude and readiness to practice ($\chi^2 = 163.25$, $P = 0.000$) score categories. Higher scores for attitudes were found for respondents with high knowledge levels. The highest number of respondents had high knowledge and high attitude scores (95%). The association between K-rP showed a higher number of respondents with low readiness to practice scores and the highest number of respondents with moderate K scores and low rP (88.5%). The relationship between A-rP illustrated a higher number of attitudes with a low rP score; low rP and low A were the highest percentages (97.2%).
Discussion
This study assessed Chinese health-care university students’ knowledge (K), attitude (A), and level of readiness to practice (rP) regarding disaster medicine and preparedness. In brief, most of the respondents had a moderate level of knowledge, a moderate level of attitude, a high level of readiness to practice, and a moderate level of total KArP. In addition, the three primary outcome measures – K, A, and rP – were significantly correlated; furthermore, K and A could be used to predict rP among health-care students.

Knowledge
The majority of the respondents in our study understood that their country is at risk of disasters; disasters come in several shapes and sizes; they are aware of the potential risks of emergencies; training plans for disaster medicine are important; and disaster medicine is a specialized area that involves multiple agencies. Moreover, the respondents mentioned that they did not have previous exposure or previous experience; pharmacy organizations were not the only responsible party; they did not read related journal articles; they were not familiar with the local emergency response system; and they were not familiar with the organizational logistics and roles among agencies in disaster medicine situations and preparedness. Overall, our study indicated that the respondents had moderate levels of knowledge in disaster medicine and preparedness. Xhaferi et al. reported that students in their study did not have much knowledge about disaster medicine and urged medical schools to include topics relevant to disaster medicine in the curriculum.[25] In a study in China, Su et al. highlighted the large gap in knowledge and traditional medical education about disaster preparedness.[13] Wunderlich et al. found similar

| Table 6: Relationships between demographic profiles and individual knowledge, attitude, readiness to practice, and total knowledge, attitude, and readiness to practice scores |
|------------------|----------------|----------------|----------------|
| Item             | Knowledge score | Attitude score | Readiness to practice score | Overall scores of KArP |
| Your age (years) (r; P) | −0.073, 0.042* | 0.172, 0.000** | 0.171, 0.000** | 0.173, 0.000** |
| Your gender (P) |                 |                |                            |                         |
| Female           | 0.000**         | 0.120          | 0.889                      | 0.091                   |
| Male             |                 |                |                            |                         |
| Your degree major (P) |             |                |                            |                         |
| Pharmacy         | 0.000**         | 0.002*         | 0.120                      | 0.004*                  |
| Medicine         |                 |                |                            |                         |
| Dental           |                 |                |                            |                         |
| Laboratory       |                 |                |                            |                         |
| Nursing          |                 |                |                            |                         |
| Your academic level (year) (P) |             |                |                            |                         |
| 1                | 0.019*          | 0.000**        | 0.000**                    | 0.000**                 |
| 2                |                 |                |                            |                         |
| 3                |                 |                |                            |                         |
| 4                |                 |                |                            |                         |
| 5                |                 |                |                            |                         |

*Significant <0.05, **Significant <0.001. KArP: Knowledge, attitude, and readiness to practice

| Table 7: Associations between knowledge, attitude, and readiness to practice scores |
|------------------|----------------|----------------|
| Correlations     | Total knowledge score | Total attitude score | Total readiness to practice score |
| Spearman’s rho   | Correlation coefficient | 0.449** | 0.312** |
|                  | Significance (two-tailed) | 0.000 | 0.000 |
|                  | n | 769 | 769 |
| Total attitude score | Correlation coefficient | 0.656** | 0.000 |
|                  | Significance (two-tailed) | 0.000 | 0.000 |
|                  | n | 769 | 769 |

**Correlation is significant at the 0.01 level (two-tailed)
results, which indicated a lack of knowledge among German medical students.\textsuperscript{[23]}

**Attitude**

We also established evidence that our respondents indicated a positive attitude toward disaster medicine preparedness. They would like to be on the future team in case of disasters; be in relevant educational classes, workshops, and training on disaster medicine preparedness; and be confident in implementing plans and procedures and being first responders. However, they were not confident in leading, managing, or coordinating a shelter/health-care/medication supply facility. The respondents agreed that they did not have emergency plans or agreements with their family members on how to execute the emergency plans when experiencing a disaster. This study illustrated a moderate level of attitude toward disaster medicine and preparedness. This study finding was similar to studies in Pakistan and Qatar conducted by Mohamed Ibrahim et al. (2020); both the studies indicated that the students had moderate attitude levels. Other studies in India, Germany, Italy, and Belgium also supported our finding, i.e., students had a somewhat positive attitude toward disaster medicine and preparedness, which can be further improved with educational and training interventions.\textsuperscript{[26-29]}

**Readiness to practice**

In terms of readiness to practice, most of the respondents were willing to attend education and training programs. They were ready to practice during disasters even when there was a shortage of essential medicines. The respondents also acknowledged the barriers (e.g. familiarity with medications during disasters and effort and time for preparation) toward readiness to practice disaster medicine and preparedness. Interestingly, the respondents showed a high level of readiness to practice, even though they had moderate levels of K and A. Respondents’ K and A were associated with rP. Our findings further showed that factors, i.e. gender, age, A, and K, can be used to predict respondents’ readiness to practice. A similar finding was indicated in a study in Germany that found that students were highly motivated despite having a lack of education on disaster medicine.\textsuperscript{[26]} Mohamed Ibrahim et al. (2020) also have supporting evidence indicating a moderate level of practice among students in Qatar and Pakistan.\textsuperscript{[26,24]}

**Limitations**

This study was conducted at one university and in one region of China. Thus, the findings may or may not be able to be generalized to the rest of the health-care profession students in the country. Furthermore, the response rates for specific degrees, such as nursing, laboratory, and pharmacy, were low. Another possible study limitation concerns social desirability bias (i.e., response bias).

**Implications of the study and lessons learned**

More studies on disaster management are needed, especially for countries that are at high risk of disasters. We need to prepare health-care professional students with adequate knowledge of disaster medicine, skills, and positive attitudes toward a willingness to practice. Disaster medicine offers attention and care for the victims of disasters. It is concerned with the medical, health, and emotional aspects of disasters, including disaster management. Health-care professionals need to be skilled and willing to respond to disasters. They need to be involved in the areas of preparedness, recovery, and mitigation. This study has provided another perspective among university students after other studies, such as Qatar, Pakistan, and a few other developing countries. Such cumulative evidence is significant for formulating strategies and planning actions to be taken by various stakeholders related to education and curriculum development in colleges, training for students on-site or using simulations, and the development of policy related to disaster management.\textsuperscript{[30]}

These findings further supported the evidence from the literature regarding disaster medicine and preparedness among university health profession students. Hence, with unexpected disaster events such as COVID-19 and the possibility of other kinds of disasters, we encouraged stakeholders in the academic and health-care sectors to put up their strategic plans to overcome these issues.\textsuperscript{[31]} Health-care workers’ willingness to work during disasters is crucial, such as working on the front lines for long hours and facing danger during the COVID-19 pandemic. These are essential aspects of disaster response. Thus, the knowledge and attitude of the staff are important and are associated with their readiness to practice in such conditions. These features need to be fostered when the students are in college and should be part of a continuous development process.

**Conclusions**

In summary, this study found that most of the students had a moderate level of knowledge, a moderate level of attitude, a high level of readiness to practice, and a moderate level of total KArP. K, A, and rP were significantly correlated, and K and A were predictors for rP among the health-care students. Before working in the health-care sector, health-care colleges need to build students’ knowledge, attitudes, and readiness to practice within the curriculum toward disaster medicine and preparedness.
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Conflicts of interest
There are no conflicts of interest.

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