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Factors Associated with Healthcare Workers Willingness to Participate in Disasters in Sana'a, Yemen

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List of Abbreviations:

CI	Confidence Interval
HCW	Healthcare workers
IQR	Interquartile range
SD	Standard Deviation

Abstract

Objectives: Willingness to participate in disasters has been indicated as a principal issue when overlooked. Hence, it requires addressing during disaster preparedness training courses to insure health service coverage. The study aims to assess healthcare workers (HCW) willingness to participate in biological and natural disasters, and its associated factors.

Design: This is a cross-sectional study, in which a self-administered questionnaire was distributed to 1093 HCW. The data was analysed using multiple logistic regression with significance level $p<0.05$. Ethical clearance and consent of the participants were duly obtained.

Setting: In three public Hospitals that provide tertiary level healthcare, in Sana'a City, Yemen.

Participants: Nurses and doctors (HCW).

Results: There were 692 (response rate 63.3%) completed the questionnaire, of which 55.1% were nurses and 44.9% were doctors. The study found that self-efficacy was associated with willingness to participate in disaster response for any type of disasters (Odds Ratio [OR]=1.328, 95% Confidence Interval [95%CI]: 1.206 to 1.464), natural disasters (OR=1.138, 95%CI: 1.064 to 1.217), and influenza pandemic (OR=1.112, 95%CI: 1.049 to 1.180). The results further show that willingness is associated with HCW being young, male and having higher educational qualifications.

Conclusion: Self-efficacy has been found to be an important factor associated with willingness. Improving self-efficacy through training in disaster preparedness may increase willingness of HCW to participate in disaster.

Key words: Disaster preparedness; willingness; self-efficacy; interpersonal; healthcare worker.

Strength and limitations of this study

- This study is the first study that attempt to assess HCW willingness to participate in different types of disasters in Sana'a City, Yemen.
- Willingness levels were found to be different in different type of disasters; the lowest willingness rate was in influenza pandemic, which considered concerning in the fragile state of Yemen and the increased number of outbreaks in the country.
- The study was survey based, using a convenience sample, however, it represented HCW in Sana'a City in term of gender and living city.
- The study data was a conversion of Likert data to binary data, so there might be some degree of bias.
- Beside the limitations that result from employing a cross-sectional design in the study, it was conducted in a city with considerable political unrest, therefore, a subsequent study is recommended.

Introduction:

In various parts of the world, disasters destroyed communities and infrastructures, causing huge material and human losses.[1] Similarly, hospitals and health centres are also affected by the disasters, which restrict its work of relieving the disaster-stricken community. Disasters is defined as "a situation or event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering".[2] By 2025, more than half of world population will live in cities, particularly in urban cities located along a seismic fault lines, flood and other natural disasters prone areas.[3]

According to the Global Facility for Disaster Reduction and Recovery (GFDRR), Yemen is one of the priority countries in the Middle East and North Africa region, mainly due to its vulnerability to disasters.[4-6] Natural disasters are recurrent in Yemen, which includes storms, landslides, earthquake and floods., Floods due to the monsoonal rainfall, is responsible for the majority of the mortality due to disaster, this is followed by storms and landslides as repeated disasters.[6] Currently in Yemen disaster management only mainly focuses on responding to post disasters damage and there is a lack of disaster preparedness such training and mock drills. The insufficient training makes it difficult to maintain preparedness.[4,7,8]

During disasters, HCW are expected to provide health care assistance to people suffering from the disasters alongside with caring for their usual patients. Some are also required to care for their dependents. Most of the previous studies reported an anticipated decrease in health workforce during disaster as not all HCW are willing to participate in a disaster. Systematic reviews have found that willingness was associated with factors like the nature and type of event; competing obligations between personal and professional needs; the

work environment and climate including personal safety; and the relationship between knowledge and perceptions of efficacy.[9,10]

Disaster preparedness activities and routine disasters trainings has been found to improve knowledge, skills and attitude preparedness of disaster.[11] However, the factors that affect willingness to participate in disasters are beyond just having knowledge on disasters management.[9-12]

In a recent systematic review, they found that only few researches have been conducted in the Middle East on willingness to participate in disasters. They recommend that further research should be conducted based on behavioural theories to better understand the Middle East context of willingness to participate in a disaster.[13] In another systematic review of 70 studies on HCW willingness to participate in disasters only 12 studies were form Asia and none of those studies was from the Middle East.[12] Therefore, the objective of this study is to determine the associations between socio-demographic, professional, and intrapersonal factors associated with doctors' and nurses' willingness to participate in disasters in response in Sana'a, Yemen.

Methods:

Study design, population and instrument

This is a cross-sectional study conducted in three public hospitals in the Sana'a Governorate, Yemen; Al-Thora, Al-Jumhouri, and Al-Kuwait hospitals, which have a more than total of 4000 nurses and doctors which were included in this study. Out of this 1093 HCW were selected through convenient sampling by approaching the healthcare providers individually. The sample size of 1093 was determined based the "perception of responsibility to participate", which is an element of the self-efficacy construct. The determined sample size

was 614, which was inflated by 78 percent based on the response rate of the previous studies.[14]

The questionnaire was developed by the researcher based on information from previous studies and opinion of national and international experts.[14-17] The questionnaire was pilot tested on doctors and nurses form a different hospital; additional feedback from local experts was sort, to ensure adequate coverage and understanding of key topics items on the questionnaire. The questionnaire consists of socio-demographic, professional, and intrapersonal factors, and willingness to participate in a disaster. The professional, intrapersonal and willingness questions was measured on a five-point Likert scale (1= strongly disagree, 2= disagree, 3=somewhat agree, 4= agree, and 5= strongly agree). A binary variable was created based on "less or equal two'' as low and" more than 2'' as high.

There were four items in the self-efficacy construct. The descriptive statistics and inter-item correlation values of the self-efficacy are presented in Table 1.

[Table 1]

Based on Table 1, there was moderate level of agreement in all the four items. The highest correlation for each item with at least one other item in the construct was between 0.3 and 0.9. in factor analysis, the Kaiser-Meyer-Olkin (KMO) value was 0.658 ($p<0.001$). A single factor was formed from the four items computed and was saved as incentive to be used in further analysis. Accordingly, to calculate the self- efficacy, four questions was asked. The sum outcome of the four answers ranged from 4 to 20 (Median 16, Interquartile range [IQR] 5).

Self-efficacy theory was chosen to build the construct as it illustrates beliefs that drives actions to face and solve problems faced to achieve goals. In case of disaster, the theory could be applied to as HCW coping with fear and threat and adapting new behaviours

because of their beliefs in their competences. This belief is derived from their successful performances, observing colleagues and managers positive behaviour, convincing by a superior person, and calming the physiological and emotional pressure caused by the threat.[18]

Data collection

Ethical approval was obtained from the Ministry of Health and Population of Yemen. Informed consent was obtained from the respondent and confidentiality of personal disclosures was re-assured. The self-administered questionnaires were distributed and retrieved between February and March 2018. A final 767 questionnaires were returned for analyses; 75 questionnaires were omitted due to missing values.

Statistical analysis

The data was analysed using Statistical Package for Social Science (SPSS) version 22. Descriptive outputs were generated describing the median, interquartile range, frequency counts and percentages. Chi square test and multiple logistic regression was performed to test the hypothesis of the study on $p<0.05$ for all statistical tests. The variables selected to be included in the multivariate analysis were variables with $p<0.25$ in the univariate analysis, and gender, age, and type of profession were also included.

Patient and Public Involvement

Patients and the general public were not involved in the design of this research. HCW were involved during the pilot study in order to test the understanding of the written questionnaire. In addition, the data was access by limited number of the research team.

Results:

Socio-demographics Characteristics

Responses are collected from 692 HCW (response rate 63.3%), where 311 (44.9%) are doctors and 381 (55.1%) nurses. Most of the female participants are nurses 64.5%. More than half of the doctors (56.6%) have more than five years of experience at their current place of work, as compare to only 40.9 per cent of the nurses. The average age of participants is 31.96 (Standard Deviation [SD] 7.46) years across the two occupations. Out of the 65.9% who have dependents, i.e., child or elderly persons, 73.9% reported to have support to care for their dependent in a case of disaster. The percentages are almost equally distributed among doctors and nurses.

Professional and Intrapersonal Characteristics

Table 2 describes the socio-demographic, professional, interpersonal, and willingness characteristics of respondents. Only 39.2% of the HCW had have any previous training in disaster. This is the same for previous work experience, where only 35.8% of the participants had previous work experience in a disaster situation.

The doctors and nurses report a high trust in work safety, in family, in colleague's preparedness to react, and in hospital preparedness to react in case of a disaster, with trust in colleague's preparedness as the highest percentage (88.3%). Similarly, HCW have a high median score (16; IQR 2) in self-efficacy construct.

Respondents willingness

Ninety percent of the participants express high willingness to participate in any type of disasters. However, they were less willing to participate in natural disasters (77.3%) and influenza pandemic (66.0%) (Table2).

[Table 2]

Factors associated with willingness to participate in any type disaster

There was an association between participants' gender and willingness to participate in any type of disaster, with male being more willing compared to female (crude OR=2.161, 95%CI: 1.307 to 3.573) (Table 3). Those with high trust in work safety (crude OR=3.284, 95%CI: 1.937 to 5.567), trust in colleague's preparedness (crude OR=2.592, 95%CI: 1.401 to 4.795) and self-efficacy (crude OR=1.358; 95%CI: 1.247 to 1.479) were also found to be more willing to participate in any type of disaster in the univariate analysis (Table 3).

In the final model, having trust in work safety (adjusted OR=2.535, 95%CI: 1.357 to 4.736) and self-efficacy (adjusted OR=1.319, 95%CI: 1.197 to1.453) were found to be associated with general willingness with any type of disasters (Table 4).

Factors associated with willingness to participate in natural disaster

In the univariate analysis, there was an association between some of the socio-demographic characteristics (age, gender, education level, type of profession and work duration) with willingness to participate in natural disasters (Table 3). Participants with bachelor and postgraduate degrees has a higher odd of willingness to participate in natural disaster disasters compared to those with diploma education. Those in the age group of

between 31 and 45 were found to be more willing when compared to participants that are 30 years old and younger (Table 3). The main interpersonal factors associated with willingness in natural disasters were participants' trust in colleagues' preparedness in case of a natural disaster, and self-efficacy (Table 3).

In multivariate, being male (adjusted OR=1.639, 95%CI: 1.102 to 2.439) and self-efficacy (adjusted OR=1.143, 95%CI: 1.069 to 1.221) were significantly associated with willingness to participate in natural disasters (Table 4).

Factors associated with willingness to participate in influenza pandemic disaster

For willingness to participate in influenza pandemic, the univariate results reveal that being male, having a dependent with no support (compared to participants without dependent), having previous experience and self-efficacy were associated with willingness to participate in pandemic (Table 3).

In the final model, having previous experience (adjusted OR=1.528, 95%CI: 1.058 to 2.207) and self-efficacy (adjusted OR=1.114, 95%CI: 1.050 to 1.182) were found to be associated with willingness to participate in influenza pandemic (Table 4).

[Table 3, Table 4]

Discussion:

Having one hundred percent participation of HCW is difficult to obtain as much as it is vital in case of disasters. Previous studies suggested that between 65 and 97 percent of HCW were willing to participate in a natural disaster, and between 54 and 86 percent in an influenza pandemic.[11,15,19,20] The reason in this difference in the levels of willingness between

the two types of disasters is due to the great distinction in their nature. The outcome of the interaction between HCW and the socioenvironmental determinants of these disasters leads to having different willingness levels. According to Conner et al, the weighted risk resulting from this interaction plays a major role in HCW willingness. In case of pandemics, the fear of the inability to control biohazards and watching colleagues inquiring a communicable disease after contact with affected persons was a suggested reason for the low willingness levels.[10] Another qualitative study in Australia highlighted that in different types of disasters emergency nurse's willingness to attend to work is shaped by the weighted risk to self and surrounding people and the pressure formed from the period dealing with the disaster.[12] Natural disasters may not directly affect HCW or their families like influenzas pandemic which may be a reason for the higher level of willingness to attend to work compared to pandemics.

The findings of this study are consistent with the previous studies regarding their willingness level to different types of disasters. More HCW were willing to participate in natural disaster (77.3%) as compared to influenza pandemic (66.0%). Even though, there were a higher percentage of HCW willingness from this study to participate in both natural disaster and influenza pandemic were higher compared to other studies, Yemen's high vulnerability, due its topography and current economic, political and health status, could affect the country health status and cause huge adverse health impacts in case of disasters. According to the Vulnerability Matrix, one third of Yemen's districts are highly vulnerable.[5]

In addition, due to the armed conflicts in Yemen that started in early 2015, it had become difficult to deal with any disaster in case it occurred. According to the World Health Organization (WHO), the healthcare system in Yemen is in a critical situation with about 50% of the health facilities in Yemen are either partially or total damage as a result of the natural disasters and conflicts. Furthermore, of the 3507 healthcare facilities in Yemen,

almost 300 healthcare facilities have been destroyed.[5,21] Therefore, any possible decrease in the health work force during disasters in Yemen must be put in considerations during response to disasters. The existed drained health sector is based on a vulnerable health system in term of its structure and healthcare staff number and distribution in the country.[22] Thus, training and preparing healthcare staff to act during disasters is critical and could help achieving Priority 4 in the United Nations' Sendai Framework for Disaster Risk Reduction 2015- 2030 in enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction of disasters, and prevent any possible humanitarian catastrophe.[23]

The results show that willingness to participate in events of natural disasters may be encouraged by many suggested factors. Factors such as respondents being male are accompanied with higher willingness to participate in natural disasters. which is similar to previous studies conducted in Jordan, China and United nations of America.[14,15,24,25] However, having less female health workers willing to participate in disasters highlight a need to address this group during health preparedness programs. This lack in female HCW willingness could be due to the gender and cultural barriers in Yemen. These barriers need to be addressed to better motivate females' workers participation in case of disasters. This is important area for research as studies on willingness moving forward.

As in previous studies, nurses and doctors with previous experience in influenza pandemic are more willing to participate in influenza pandemic.[24,26] HCW which has experience with a previous disaster have better knowledge in disaster management, copping strategies, and ways to protect themselves and their families; which may be a reason for having higher odds of willingness. According to Alzahrani et al., Most of the nurses have a higher level in Mass gatherings management such as communicating effectively during emergencies in Saudi Arabia due to Previous experience, he also found a need for further

trainings by the nurses.[27] Chokahi et al., found that simulation training, attending conferences and previous experience of increase paediatric surgeons feeling of preparedness.[26]

This study found that trust in work safety during any type of disaster play key role in willingness to participate, which is similar to results from previous studies.[11,24,28] Work safety is important in order for HCP to feel safe and do their work, a study by Stergachis et al, found that majority of the participants reported their fear or concern for self in case of influenza pandemic and during earthquake scenarios as one of the major barriers to willingness.[29] Considering work safety in disaster preparedness is especially important in Yemen after notifications made by Aldahrai et al. and Naser et al. on the current low work place safety and the needs of increasing safety and security standards in hospitals in Yemen Health establishments, regardless to external or internal catastrophes; unsafe work place could lead to increase optional absenteeism during disaster.[7,8] Thus, putting information on work safety and protection devices provided during several types of disasters is advisable.

Many studies have established the association between self-efficacy and willingness to participate in disasters in previous.[10,14,15] Similarly, this study have identified that self-efficacy plays an important role in willingness to participate in natural disasters, in influenza pandemic and any type of disasters. It indicates that elements tested for self-efficacy like participants increase familiarity with their role, responsibility to react, and confidence of ability to deal with various types of disasters could be a key factor to increase HCP self-efficacy, thus, increase their willingness. Disaster preparedness trainings are encouraged to contain martials that explain response to different type of disasters, doctors' and nurses' role in disasters and how it makes a different in response to disasters. Supportive measures to increase HCW self-efficacy such as immediate communication with needed information and rewarding for efforts in disasters are suggested.

Strength and limitation

Regardless of the limitation of this study, it had substantial strengths. it is the first study explored the patterns of the willingness status in the Yemen and the factors associated with it. Also, study was distributed in person to the HCP to ensure obtaining higher response rate. In addition, it was using self-administered questionnaire to minimise information bias such as interviewer bias.

This study had limitations, as the study was performed under a political insecurity/ fragile state of the country a list of workers of HCP working at the hospitals was difficult to obtained. As a result, a universal sample was undertaken which could limit the study representativeness. Other than the self-administrated questionnaire limitations, the study findings are limited to staff working at the tertiary level public hospitals in urban areas of Yemen.

Conclusion:

Increased the likelihood of willingness to participate in disaster play a key role in guarantee optimum number of work force. This study indicates that one's socio-demographic, professional and intrapersonal factors plays a role in increase his/her willingness in general and across different type of disasters. Significant differences were revealed between participants' willingness in natural disasters by gender and self-efficacy, and participant's willingness in influenza pandemics by previous experience and self-efficacy. This result suggests integrating disaster management into an earlier education levels of doctors' and nurses' educational establishments. Other areas for preparedness may include increase hospitals safety and resilience; Hence that willingness to participate in natural disasters' response was influence by demographic characteristic of the healthcare personnel, others

found outside the bracket should be motivated to participate with a reward package such as incentives and hazard allowance. Further studies should be conducted in both urban and rural settings with relatively peaceful atmosphere.

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Table 1: Descriptive statistics and inter-term correlation for items in self-efficacy

Items	Descriptive statistics		Inter-item correlation			
	Mean	SD	item 1	item 2	item 3	item 4
Item 1: Ability to perform work	3.36	1.074	1.000	0.592	0.267	0.259
Item 2: Familiarity with their role	3.62	1.085	0.592	1.000	0.325	0.324
Item 3: Responsibility to participate	4.23	0.929	0.267	0.325	1.000	0.390
Item 4: Ability report to work	4.03	1.062	0.259	0.324	0.390	1.000

Table 2: Socio-demographic, professional, interpersonal, and willingness Characteristics of Respondents

Variable		Frequency (n= 692)	Percentage (%)
Age (years)	≤30	360	52.0
	31-45	294	42.5
	≥46	38	5.5
Gender	Male	419	60.5
	Female	273	39.5
Marital-status	Single	258	37.3
	Married	420	60.7
	Divorce	8	1.2
	Widow	6	0.9
Education-level	Diploma	280	40.5
	Bachelor	275	39.7
	Post graduate education	137	19.8
	Master	104	15.0
	Professional	33	4.8
Profession type	Doctors	311	44.9
	Specialist medical practitioner	126	8.2
	General medical practitioner	185	26.7
	Nurses	381	55.1
Work duration (years)	≤5	360	52
	6-10	213	30.8
	11-15	76	11.0
	≥16	43	6.2
Dependent	With dependent	456	65.9
	Elder	65	9.4
	Child	276	39.9
	Both	115	16.6
	No dependent	236	34.1
[a]Support	No	119	26.1
	Yes	337	73.9
[b]Previous training	With previous training	271	39.2
	Without previous training	421	60.8
[b]Previous experience	With previous experience	248	35.8
	Without previous training	444	64.2
Trust in work safety in case of disaster	High trust in work safety	563	81.4
	Low trust in work safety	129	18.6
Trust in family preparedness in case of a disaster	High trust in family preparedness	544	78.6
	Low trust in family preparedness	148	21.4
Trust in colleague preparedness to react in disaster	High trust in colleague preparedness	611	88.3
	Low trust in colleague preparedness	81	11.7

Trust in hospital preparedness to react in disaster	High trust in hospital preparedness	522	75.4
	Low trust in hospital preparedness	170	24.6
Self-efficacy score (Median; Inter-Quartile)		16	5
Willingness to participate in Any type of disaster	High	623	90.0
	Low	69	10.0
Willingness to participate in Natural disaster	High	535	77.3
	Low	157	22.7
Willingness to participate in Influenza and Pandemic	High	457	66.0
	Low	235	34.0

[a]*Only for participants with dependants. The percentages are only within participants with dependents.*
[b]*Previous experience and training in disasters*

Table 3: Univariate association of crude socio-demographic, professional and interpersonal characteristics with willingness in any type of disaster, in natural disasters, or in influenza pandemic

Variable	Willingness to participate in any type of disasters Odds ratio (95% C.I.)	Willingness to participate in natural disasters Odds ratio (95% C.I.)	Willingness to participate in influenza pandemic Odds ratio (95% C.I.)
Age			
≤30	1	1	1
31-45	1.056 (0.628-1.775)	**1.639** (1.126-2.387)	1.138 (0.822-1.576)
≥46	0.733 (0.269-1.997)	1.967 (0.798-4.850)	1.354 (0.650-2.820)
Gender			
Female	1	1	1
Male	**2.161** (1.307-3.573)	**2.254** (1.571-3.234)	**1.505** (1.093-2.072)
Marital status			
Single	1	1	1
Married	0.899 (0.532-1.521)	1.128 (0.781-1.629)	1.090 (0.787-1.510)
Divorce and widow	0.615 (0.130-2.913)	1.160 (0.314-4.291)	1.362 (0.416-4.466)
Education Level			
Up to Diploma	1	1	1
Up to Bachelor	1.380 (0.775-2.458)	**1.962** (1.317-2.922)	1.221 (0.858-1.738)
Up to Postgraduate	0.847 (0.450-1.596)	**2.279** (1.351-3.842)	0.998 (0.651-1.528)
Profession type			
Nurses	1	1	1
General medical practitioner	1.473 (0.781-2.776)	**1.554** (1.013-2.384)	0.756 (0.524-1.091)
Specialist medical practitioner	0.965 (0.507-1.835)	**2.407** (1.377-4.208)	0.942 (0.614-1.446)
Work duration			
≤5	1	1	1
6-10	1.006 (0.563-1.798)	1.079 (0.721-1.614)	0.975 (0.683-1.392)
11-15	1.028 (0.438-2.415)	**2.337** (1.118-4.882)	1.059 (0.626-1.791)
≥16	0.456 (0.196-1.063)	0.650 (0.329-1.286)	1.198 (0.603-2.379)
Presence of dependent			
No dependent	1	1	1
Dependent with no support	0.673 (0.346-1.308)	1.149 (0.683-1.933)	**1.617** (1.000-2.612)
Dependent with support	1.253 (0.707-2.222)	1.305 (0.880-1.935)	1.283 (0.907-1.815)
[a]Previous training			
No	1	1	1
Yes	1.653 (0.959-2.849)	1.090 (0.756-1.573)	1.147 (0. 829-1.585)
[a]Previous experience			
No	1	1	1
Yes	1.216 (0.714-2.070)	0.974 (0.673-1.411)	**1.857** (1.317-2.619)
Trust in work safety			

Low	1	1	1
High	**3.284** (1.937-5.567)	1.280 (0.825-1.987)	1.192 (0.800-1.774)
Trust in family preparedness			
Low	1	1	1
High	1.338 (0.756-2.369)	1.292 (0.850-1.963)	0.990 (.0674-1.454)
Trust in colleague's preparedness			
Low	1	1	1
High	**2.592** (1.401-4.795)	**1.974** (1.200-3.246)	1.392 (0.866-2.237)
Trust in hospital preparedness			
Low	1	1	1
High	1.392 (0.807-2.400)	1.212 (0.810-1.814)	1.158 (0.807-1.663)
[b]**Self-efficacy**	**1.358** (1.247-1.479)	**1.184** (1.115-1.257)	**1.135** (1.076-1.197)

[a]Previous experience and training in disasters
[b]*Continuous measure, with one unit increase in self-efficacy*

Table 4: Multivariate association of adjusted professional and interpersonal characteristics with willingness in any type of disaster, in natural disasters, or in influenza pandemic

Variable	Willingness to participate in any type of disasters Odds ratio (95% C.I.)	Willingness to participate in natural disasters Odds ratio (95% C.I.)	Willingness to participate in influenza pandemic Odds ratio (95% C.I.)
Age			
≤30	1	1	1
31-45	1.137 (0.609-2.121)	1.432 (0.928-2.209)	1.008 (0.695-1.461)
≥46	0.440 (0.136-1.418)	1.087 (0.409-2.886)	1.062 (0.484-2.332)
Gender			
Female	1	1	1
Male	1.456 (0.807-2.628)	**1.639** (1.102-2.439)	1.131 (0.793-1.612)
Education Level			
Up to Diploma	-	1	-
Up to Bachelor	-	1.706 (0.993-2.932)	-
Up to Postgraduate	-	1.177 (0.522-2.657)	-
Profession type			
Nurses	1	1	1
General medical practitioner	1.285 (0.438-3.767)	1.581 (0.691-3.614)	0.751 (0.468-1.205)
Specialist medical practitioner	1.392 (0.578-3.352)	0.939 (0.515-1.713)	0.697 (0.473-1.026)
Presence of dependent			
No dependent	-	-	1
Dependent with no support	-	-	1.537 (0.910-2.598)
Dependent with support	-	-	1.154 (0.791-1.685)
[a]**Previous experience**			
No	-	-	1
Yes	-	-	**1.528** (1.058-2.207)
Trust in work safety			
Low	1	-	-
High	**2.535** (1.357-4.736)	-	-
Trust in colleague's preparedness			
Low	1	1	-
High	1.199 (0.576-2.496)	1.363 (0.791-2.351)	-
[b]**Self-efficacy**	**1.319** (1.197-1.453)	**1.143** (1.069-1.221)	**1.114** (1.050-1.182)

[a]Previous experience and training in disasters

[b]*Continuous measure, with one unit increase in self-efficacy*

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	Main document (l)
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	Main document (1)
Background /	#2	Explain the scientific background and rationale for the	Main document

rationale		investigation being reported	(3)
Objectives	#3	State specific objectives, including any prespecified hypotheses	Main document (4)
Study design	#4	Present key elements of study design early in the paper	Main document (4)
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Main document (4-6)
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	Main document (4)
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Main document (5), table1 (Page 18)
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for exposed and unexposed groups if applicable.	Main document (5)
Bias	#9	Describe any efforts to address potential sources of bias	Main document (13)
Study size	#10	Explain how the study size was arrived at	Main document (4,5)
Quantitative	#11	Explain how quantitative variables were handled in the	Main document

variables		analyses. If applicable, describe which groupings were chosen, and why	(6)
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	Main document (6)
	#12b	Describe any methods used to examine subgroups and interactions	Main document (6)
	#12c	Explain how missing data were addressed	Main document (6)
	#12d	If applicable, describe analytical methods taking account of sampling strategy	Main document (4, 6)
	#12e	Describe any sensitivity analyses	
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	Main document (4, 6)
	#13b	Give reasons for non-participation at each stage	Main document (4, 6, 13)
	#13c	Consider use of a flow diagram	
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if	Main document (7,8), table 2 (page 19, 20)

		applicable.	
	#14b	Indicate number of participants with missing data for each variable of interest	Table 2 (page 19, 20)
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	Main document (7), table 2 (page 19, 20)
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Main document (8, 9), table 3, 4 (page 21-23)
	#16b	Report category boundaries when continuous variables were categorized	Main document 5
	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	
Key results	#18	Summarise key results with reference to study objectives	Main document (6-9)
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	Main document (12, 13)
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results	Main document (9-12)

		from similar studies, and other relevant evidence.	
Generalisability	#21	Discuss the generalisability (external validity) of the study results	Main document (13)
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Main document (14)

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Factors associated with Healthcare Workers Willingness to Participate in Disasters: a cross-sectional study in Sana'a, Yemen

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Factors associated with Healthcare Workers Willingness to Participate in Disasters: a cross-sectional study in Sana'a, Yemen

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Contributorship statement:

- WA – conceptualized the study, conducted the data collection, analysis, and interpretation of data for the work; draft and approve the manuscript for publication.
- VCWH – conceptualized the study, interpretation of data for the work; revise and approve the manuscript for publication.
- KC – conceptualized the study, supervised the data analysis, interpretation of data for the work.

List of Abbreviations:

CI	Confidence Interval
HCW	Healthcare workers
IQR	Interquartile range
SD	Standard Deviation

Abstract

Objectives: Willingness to participate in disasters are usually overlooked and not addressed in disaster preparedness training courses to ensure health service coverage. This will lead to issue during the disaster. This study aims to assess healthcare workers (HCW) willingness to participate in biological and natural disasters, and to identify its associated factors.

Design: This is a cross-sectional study using a self-administered questionnaire. The questionnaire was distributed to 1093 HCW. The data was analysed using multiple logistic regression with significance level $p<0.05$. Ethical clearance and consent of the participants were duly obtained.

Setting: In three public Hospitals that provide tertiary level healthcare in Sana'a City, Yemen.

Participants: Nurses and doctors (HCW).

Results: There were 692 (response rate 63.3%) completed the questionnaire, of which 55.1% were nurses and 44.9% were doctors. The study found that self-efficacy was associated with willingness to participate in disaster response for any type of disasters (Odds Ratio [OR]=1.328, 95% Confidence Interval [95%CI]: 1.206 to 1.464), natural disasters (OR=1.138, 95%CI: 1.064 to 1.217), and influenza pandemic (OR=1.112, 95%CI: 1.049 to 1.180). The results further show that willingness is associated with HCW being young, male and having higher educational qualifications.

Conclusion: Self-efficacy has been found to be an important factor associated with willingness. Improving self-efficacy through training in disaster preparedness may increase willingness of HCW to participate in a disaster.

Key words: Disaster preparedness; willingness; self-efficacy; intrapersonal; healthcare worker.

Strength and limitations of this study

- This study is the first study that attempt to assess HCW willingness to participate in different types of disasters in Sana'a City, Yemen.
- Implementing a cross-sectional design and using a convenience sample has made it difficult to establish causal association.
- The study samples represents HCW in Sana'a City in term of gender and locality.
- The face to face approach, which included introduction of the study and its objectives, ensured a higher response rate and minimised the risk of selection bias.

Introduction:

In various parts of the world, disasters destroy communities and infrastructures, causing huge material and human losses.[1] Similarly, hospitals and health centres are also affected by the disasters, which restrict its work of relieving disaster-stricken communities. By 2025, more than half of world population will live in cities, particularly in urban cities located along a seismic fault lines, flood and other natural disasters prone areas.[2] Therefore, healthcare worker (HCW) should be prepared to manage the influx of patient during possibly life threatening circumstances. Healthcare worker is defined as "the one who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even medical waste handlers".[3]

According to the Global Facility for Disaster Reduction and Recovery (GFDRR), Yemen is one of the priority countries in the Middle East and North Africa region, mainly due to its vulnerability to disasters.[4-6] Natural disasters are recurrent in Yemen, which includes storms, landslides, earthquake and floods. Floods due to the monsoonal rainfall, is responsible for the majority of the mortality due to disaster.[6] Currently in Yemen, disaster management only mainly focuses on responding to post disasters damage, and there is a lack of disaster preparedness, such training and mock drills. The insufficient training makes it difficult to maintain preparedness.[4,7,8] A competent prepared healthcare worker could better mitigate and respond to the community health needs during crises, which in turn will elevate health outcomes.

During disasters, HCW are expected to provide health care assistance to people suffering from the disasters alongside with caring for their usual patients. Some are also required to care for their dependents. Most of the previous studies reported an anticipated decrease in health workforce during disaster as not all HCW are willing to participate in a

disaster. Therefore, understanding the factors associated with willingness to participate in a disaster would allow more effective planning for disaster situation. Systematic reviews have found that willingness was associated with factors like the nature and type of event; competing obligations between personal and professional needs; the work environment and climate including personal safety, and the relationship between knowledge and perceptions of efficacy.[9,10]

Disaster preparedness activities and routine disasters trainings has been found to improve knowledge, skills and attitude preparedness of disaster.[11] However, the factors that affect willingness to participate in disasters are beyond just having knowledge on disasters management.[9-12]

In a recent systematic review, they found only few studies that have been conducted in the Middle East on willingness to participate in disasters. They recommend that further research should be conducted based on behavioural theories to better understand the Middle East context of willingness to participate in a disaster.[13] In another systematic review of 70 studies on HCW willingness to participate in disasters, only 12 studies were form Asia and none of those studies was from the Middle East.[11] Therefore, the objective of this study is to determine the associations between socio-demographic, professional, and intrapersonal factors associated with doctors' and nurses' willingness to participate in disasters in response in Sana'a, Yemen. The study factors was built based on the self-efficacy behavioural theory.

Methods:

Study design, population and instrument

This is a cross-sectional study conducted in three public hospitals in the Sana'a Governorate, Yemen; Al-Thora, Al-Jumhouri, and Al-Kuwait hospitals, which have more than a total of 4,000 nurses and doctors, which was the focus of this study. Out of this, 1093

HCW were selected through convenient sampling by approaching the healthcare workers individually. The sample size calculation was based on a 95% confidence interval with a power of set to 80%. The sample size of 1093 was determined based on the variable "perception of responsibility to participate" from a pre-study, which is an element of the self-efficacy construct with the highest sample size to achieve an association.[14] The determined sample size was 614, which was inflated by 78 percent based on the lowest response rate of previous studies to reach 1093.[15]

The questionnaire was developed by the researcher based on information from previous studies and opinion of national and international experts (supplementary martials).[15-18] The questionnaire was pre tested for validity and reliability. The questionnaire was distributed to national and international expert together with a questions on the validity of the questionnaire with a scale of 1 to 4 (1 not relevant to 4 highly relevant). It tested the questionnaire consistency, relatedness, representativeness and clarity of wording. As a result, six items of the questionnaire, which was related to the knowledge construct, was deleted and changes on the questions was reworded. These questions have undergone forward and backward-translation form English to Arabic then from Arabic to English. Then the researcher used a face to face meeting with three HCW, where the study objective was explained, then the participants were asked to give their comments on what they think of the questions.

The questionnaire was pilot tested on 20 doctors and nurses from a hospital, other than hospitals that have been chosen for the study. The internal consistency was assessed using Cronbach's alpha. Self- efficacy was 0.801, which considered good inter-correlation. Therefore, the self-efficacy four items were used in the final survey to build the construct as one of the intrapersonal factors. The pilot study have not published yet. The questionnaire consists of socio-demographic, professional, and intrapersonal factors, and willingness to

participate in a disaster. The professional, intrapersonal and willingness questions was measured on a five-point Likert scale (1=strongly disagree, 2=disagree, 3=somewhat agree, 4=agree, and 5=strongly agree). A binary variable was created based on “less or equal two’’ as low and” more than 2’’ as high.

Self-efficacy theory

Self-efficacy theory was chosen to build the self-efficacy construct as it illustrates beliefs that drive actions to face and solve problems faced to achieve intended goals. In case of disaster, the theory could be applied to HCW who are coping with fear and threat and adapting new behaviours because of their beliefs in their competences. This belief is derived from their successful performances, observing colleagues and managers positive behaviour, convincing by a superior person, and calming the physiological and emotional pressure caused by the threat.[19]

Data collection

Ethical approval was obtained from the Ministry of Health and Population of Yemen. Informed consent was obtained from the respondent and confidentiality of personal disclosures was re-assured. The self-administered questionnaires were distributed and retrieved between February and March 2018. A final 767 questionnaires were returned for analyses; 75 questionnaires were omitted due to missing values.

Statistical analysis

The data was analysed using Statistical Package for Social Science (SPSS) version 22. Descriptive outputs were generated describing the median, interquartile range, frequency counts and percentages. Chi square test and multiple logistic regression was performed to test

the hypothesis of the study on $p<0.05$ for all statistical tests. The variables selected to be included in the multivariate analysis were variables with $p<0.25$ in the univariate analysis, and gender, age, and type of profession were also included.

Patient and Public Involvement

Patients and the general public were not involved in the conduct of this research. HCW were involved during the pilot study in order to test the understanding of the written questionnaire. In addition, the data was assessable by the researchers and is stored in a secure file in the computer and online storage.

Results:

Socio-demographics Characteristics

Responses were collected from 692 HCW (response rate 63.3%), where 311 (44.9%) were doctors and 381 (55.1%) were nurses. Most of the female participants were nurses 64.5%. More doctors (56.6%) had >5 years of experience at their current place of work, as compare to nurses (40.9%). The average age of participants was 31.96 (Standard Deviation [SD] 7.46) years across the two occupations. Out of the 65.9% who had dependents, i.e., having to take-care of child or elderly persons, 73.9% reported to have support to care for their dependent in a case of disaster. The percentages were almost equally distributed between doctors and nurses.

Professional and Intrapersonal Characteristics

Table 1 describes the socio-demographic, professional, intrapersonal, and willingness characteristics of respondents. Only 39.2% of the HCW had have any previous training in disaster. This was the same for previous work experience, where only 35.8% of the participants had previous work experience in a disaster situation.

The doctors and nurses reported a high trust in work safety, in family, in colleague's preparedness to react, and in hospital preparedness to react in case of a disaster, with trust in colleague's preparedness as the highest percentage (88.3%). Similarly, HCW had a high median score (16; IQR 2) in self-efficacy construct.

Respondents' willingness

Ninety percent of the participants expressed high willingness to participate in any type of disasters. However, they were less willing to participate in natural disasters (77.3%) and influenza pandemic (66.0%) (Table 1).

[Table 1]

Analysis of Self-efficacy's factors

There were four items in the self-efficacy construct. After the data collection, the inter-correlation value of self- efficacy was tested before running the main analysis. The descriptive statistics and inter-item correlation values of the self-efficacy are presented in Table 2.

[Table 2]

Based on Table 2, there was moderate level of agreement in all the four items. The highest correlation for each item with at least one other item in the construct was between 0.3 and 0.9. In factor analysis, the Kaiser-Meyer-Olkin (KMO) value was 0.658 ($p<0.001$), KMO value close to 1, so the variables are suitable for factor analysis. Therefore, a single factor was formed from the four items computed and was saved as incentive to be used in further analysis. Accordingly, to calculate the self- efficacy, four questions was asked. The sum outcome of the four answers ranged from 4 to 20 (Median 16, Interquartile range [IQR] 5).

Factors associated with willingness to participate in any type disaster

There was an association between participants' gender and willingness to participate in any type of disaster, with male being more willing compared to female (crude OR=2.161, 95%CI: 1.307 to 3.573) (Table 3). Those with high trust in work safety (crude OR=3.284, 95%CI: 1.937 to 5.567), trust in colleague's preparedness (crude OR=2.592, 95%CI: 1.401 to 4.795) and self-efficacy (crude OR=1.358; 95%CI: 1.247 to 1.479) were also found to be more willing to participate in any type of disaster in the univariate analysis (Table 3).

In the final model, having trust in work safety (adjusted OR=2.535, 95%CI: 1.357 to 4.736) and self-efficacy (adjusted OR=1.319, 95%CI: 1.197 to1.453) were found to be associated with general willingness with any type of disasters (Table 4).

Factors associated with willingness to participate in natural disaster

In the univariate analysis, there was an association between some of the socio-demographic characteristics (age, gender, education level, type of profession and work duration) with willingness to participate in natural disasters. Participants with bachelor and postgraduate degrees had a higher odd of willingness to participate in natural disaster

disasters compared to those with diploma education. Those in the age group of between 31 and 45 were found to be more willing when compared to participants who were ≤30 years old. The main intrapersonal factors associated with willingness in natural disasters were participants' trust in colleagues' preparedness in case of a natural disaster, and self-efficacy (Table 3).

In multivariate, being male (adjusted OR=1.639, 95%CI: 1.102 to 2.439) and self-efficacy (adjusted OR=1.143, 95%CI: 1.069 to 1.221) were significantly associated with willingness to participate in natural disasters (Table 4).

Factors associated with willingness to participate in influenza pandemic disaster

For willingness to participate in influenza pandemic, the univariate results revealed that being male, having a dependent with no support (compared to participants without dependent), having previous experience and self-efficacy were associated with willingness to participate in pandemic (Table 3).

In the final model, having previous experience (adjusted OR=1.528, 95%CI: 1.058 to 2.207) and self-efficacy (adjusted OR=1.114, 95%CI: 1.050 to 1.182) were found to be associated with willingness to participate in influenza pandemic (Table 4).

[Table 3, Table 4]

Discussion:

This study contained a main question that is to test the strength and direction of association between the independent variables- socio-demographic, professional, and intrapersonal variables- with the variables of willingness to participate in three different types of disasters. The results showed that trust in work safety and self-efficacy were associated with disaster participation willingness after in the multivariate analysis. Gender and self-efficacy were found to be significantly associated with willingness to participate in natural disaster. While previous experience and self-efficacy were statistically significant with willingness of HCW to participate in influenza pandemic.

Having one hundred percent participation of HCW is difficult to obtain as much as it is vital in case of disasters. Previous studies suggested that between 65 and 97 percent of HCW were willing to participate in a natural disaster, and between 54 and 86 percent in an influenza pandemic.[11,16,20,21] The reason in this difference in the levels of willingness between the two types of disasters is due to the great distinction in their nature. The outcome of the interaction between HCW and the socio-environmental determinants of these disasters leads to having different willingness levels. According to Connor et al., the weighted risk resulting from this interaction plays a major role in HCW willingness.[10] In case of pandemics, the fear of the inability to control biohazards and watching colleagues inquiring a communicable disease after contact with affected persons was a suggested reason for the low willingness levels.[10] Another qualitative study in Australia highlighted that in different types of disasters emergency nurses' willingness to attend to work is shaped by the weighted risk to self and surrounding people and the pressure formed from the period dealing with the disaster.[12] Natural disasters may not directly affect HCW or their families like influenzas pandemic

which may be a reason for the higher level of willingness to attend to work compared to pandemics.

The findings of this study are consistent with the previous studies regarding their willingness level to different types of disasters. More HCW were willing to participate in natural disaster (77.3%) as compared to influenza pandemic (66.0%). Even though, there were a higher percentage of HCW willingness from this study to participate in both natural disaster and influenza pandemic were higher compared to other studies, Yemen's high vulnerability, due its topography and current economic, political and health status, could affect the country health status and cause huge adverse health impacts in case of disasters. According to the Vulnerability Matrix, one third of Yemen's districts are highly vulnerable.[5]

In addition, due to the armed conflicts in Yemen that started in early 2015, it had become difficult to deal with any disaster in case it occurred. According to the World Health Organization (WHO), the healthcare system in Yemen is in a critical situation with about 50% of the health facilities in Yemen are either partially or total damage as a result of the natural disasters and conflicts. Furthermore, of the 3,507 healthcare facilities in Yemen, almost 300 healthcare facilities have been destroyed.[5,22] Therefore, any possible decrease in the health work force during disasters in Yemen must be put in considerations during response to disasters. The existed drained health sector is based on a vulnerable health system in term of its structure and healthcare staff number and distribution in the country.[23] Thus, training and preparing healthcare staff to act during disasters is critical and could help achieving Priority 4 in the United Nations' Sendai Framework for Disaster Risk Reduction 2015-2030 in enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction of disasters, and prevent any possible humanitarian catastrophe.[24]

The results show that willingness to participate in events of natural disasters may be encouraged by many suggested factors. Factors such as respondents being male are accompanied with higher willingness to participate in natural disasters. The findings is similar to previous studies conducted in Jordan, China and United States of America.[15,16,25,26] However, having less female health workers willing to participate in disasters highlight a need to address this group during health preparedness programs. This lack in female HCW willingness could be due to the gender and cultural barriers in Yemen. These barriers need to be addressed to better motivate females workers participation in case of disasters. This is important area for research as studies on willingness moving forward.

As in previous studies, nurses and doctors with previous experience in influenza pandemic are more willing to participate in influenza pandemic.[14, 25] HCW which has experience with a previous disaster have better knowledge in disaster management, copping strategies, and ways to protect themselves and their families; which may be a reason for having higher odds of willingness. According to Alzahrani et al., Most of the nurses have a higher level in Mass gatherings management such as communicating effectively during emergencies in Saudi Arabia due to Previous experience, he also found a need for further trainings by the nurses.[27] Chokahi et al., found that simulation training, attending conferences and previous experience of increase paediatric surgeons feeling of preparedness.[14]

This study found that trust in work safety during any type of disaster play key role in willingness to participate, which is similar to results from previous studies.[11,25,28] Work safety is important in order for HCW to feel safe and do their work, a study by Stergachis et al., found that majority of the participants reported their fear or concern for self in case of influenza pandemic and during earthquake scenarios as one of the major barriers to willingness.[29] Considering work safety in disaster preparedness is especially important in Yemen after notifications made by Aldahrai et al., and Naser et al., on the current low work

place safety and the needs of increasing safety and security standards in hospitals in Yemen Health establishments, regardless to external or internal catastrophes; unsafe work place could lead to increase optional absenteeism during disaster.[7,8] Thus, putting information on work safety and protection devices provided during several types of disasters is advisable.

Many studies have established the association between self-efficacy and willingness to participate in disasters in previous.[10,15,16] Similarly, this study have identified that self-efficacy plays an important role in willingness to participate in natural disasters, in influenza pandemic and any type of disasters. It indicates that elements tested for self-efficacy like participants increase familiarity with their role, responsibility to react, and confidence of ability to deal with various types of disasters could be a key factor to increase HCW self-efficacy, thus, increase their willingness. Disaster preparedness trainings are encouraged to contain martials that explain response to different type of disasters, doctors' and nurses' role in disasters and how it makes a different in response to disasters. Supportive measures to increase HCW self-efficacy such as immediate communication with needed information and rewarding for efforts in disasters are suggested.

Although the study has faced challenges in the sense of collecting the data during political unrest in the country, the data was collected from three of the major public hospital. The quality of data was insured by explaining the study and its objectives, and answering any question that may arise. This prevented difference in understanding the questions and increased participants' inclusion in the study. All and all the study suggested the vital value of increasing self-efficacy and its element in order to obtain more willingness.

Strength and limitation

This is the first study explored the patterns and associated factors of the willingness status to participate in disasters among healthcare workers in Yemen. The response rate was also high as the questionnaire was distributed personally by the researcher. The questionnaire was pilot tested; this was to ensure that the validity of questionnaire.

This study had limitations, as the study was performed under a political insecurity/ fragile state of the country a list of workers of HCW working at the hospitals was difficult to obtain. As a result, a universal sample was undertaken which could limit the study representativeness. This is a cross-sectional study using a self-administered questionnaire, where the actual willingness of the respondents cannot be ascertained. The respondents may answer positively due to social desirability bias. Other than the self-administrated questionnaire limitations, the study findings are limited to staff working at the tertiary level public hospitals in urban areas of Yemen.

Conclusion:

Increased the likelihood of willingness to participate in disaster play a key role in guarantee optimum number of work force. This study indicates that one's socio-demographic, professional and intrapersonal factors plays a role in increase his/her willingness in general and across different type of disasters. Significant differences were revealed between participants' willingness in natural disasters by gender and self-efficacy, and participant's willingness in influenza pandemics by previous experience and self-efficacy. This result suggests integrating disaster management into an earlier education levels of doctors' and nurses' educational establishments. This could be achieved by adding early exposure of

healthcare workers to relevant disaster experience which would further boost their willingness to participate in disaster response.

Other areas for preparedness may include increase hospitals safety and resilience; hence that willingness to participate in natural disasters' response was influence by demographic characteristic of the healthcare personnel, others found outside the bracket should be motivated to participate with a reward package such as incentives and hazard allowance. Further studies should be conducted in both urban and rural settings with relatively peaceful atmosphere.

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Table 1: Socio-demographic, professional, intrapersonal, and willingness

Characteristics of Respondents

Variable		Frequency (n= 692)	Percentage (%)
Age (years)	≤30	360	52.0
	31-45	294	42.5
	≥46	38	5.5
Gender	Male	419	60.5
	Female	273	39.5
Marital-status	Single	258	37.3
	Married	420	60.7
	Divorce	8	1.2
	Widow	6	0.9
Education-level	Diploma	280	40.5
	Bachelor	275	39.7
	Post graduate education	137	19.8
	Master	104	15.0
	Professional	33	4.8
Profession type	Doctors	311	44.9
	Specialist medical practitioner	126	8.2
	General medical practitioner	185	26.7
	Nurses	381	55.1
Work duration (years)	≤5	360	52
	6-10	213	30.8
	11-15	76	11.0
	≥16	43	6.2
Dependent	With dependent	456	65.9
	Elder	65	9.4
	Child	276	39.9
	Both	115	16.6
	No dependent	236	34.1
[a]Support	No	119	26.1
	Yes	337	73.9
[b]Previous training	With previous training	271	39.2
	Without previous training	421	60.8
[b]Previous experience	With previous experience	248	35.8
	Without previous training	444	64.2
Trust in work safety in case of disaster	High trust in work safety	563	81.4
	Low trust in work safety	129	18.6
Trust in family preparedness in case of a disaster	High trust in family preparedness	544	78.6
	Low trust in family preparedness	148	21.4
Trust in colleague preparedness to react in disaster	High trust in colleague preparedness	611	88.3
	Low trust in colleague preparedness	81	11.7

Trust in hospital preparedness to react in disaster	High trust in hospital preparedness	522	75.4
	Low trust in hospital preparedness	170	24.6
Self-efficacy score (Median; Inter-Quartile)		16	5
Willingness to participate in Any type of disaster	High	623	90.0
	Low	69	10.0
Willingness to participate in Natural disaster	High	535	77.3
	Low	157	22.7
Willingness to participate in Influenza and Pandemic	High	457	66.0
	Low	235	34.0

[a]*Only for participants with dependants. The percentages are only within participants with dependents.*
[b]*Previous experience and training in disasters*

Table 2: Descriptive statistics and inter-term correlation for items in self-efficacy

Items	Descriptive statistics		Inter-item correlation			
	Mean	SD	item 1	item 2	item 3	item 4
Item 1: Ability to perform work	3.36	1.074	1.000	0.592	0.267	0.259
Item 2: Familiarity with their role	3.62	1.085	0.592	1.000	0.325	0.324
Item 3: Responsibility to participate	4.23	0.929	0.267	0.325	1.000	0.390
Item 4: Ability report to work	4.03	1.062	0.259	0.324	0.390	1.000

Table 3: Univariate association of crude socio-demographic, professional and intrapersonal characteristics with willingness in any type of disaster, in natural disasters, or in influenza pandemic

Variable	Willingness to participate in any type of disasters		Willingness to participate in natural disasters		Willingness to participate in influenza pandemic	
	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value
Age						
≤30	1	1	1	1	1	1
31-45	1.056 (0.628-1.775)	0.838	**1.639** (1.126-2.387)	**0.010**	1.138 (0.822-1.576)	0.437
≥46	0.733 (0.269-1.997)	0.544	1.967 (0.798-4.850)	0.142	1.354 (0.650-2.820)	0.418
Gender						
Female	1	1	1	1	1	1
Male	**2.161** (1.307-3.573)	**0.003**	**2.254** (1.571-3.234)	**<0.001**	**1.505** (1.093-2.072)	**0.012**
Marital status						
Single	1	1	1	1	1	1
Married	0.899 (0.532-1.521)	0.692	1.128 (0.781-1.629)	0.521	1.090 (0.787-1.510)	0.605
Divorce and widow	0.615 (0.130-2.913)	0.541	1.160 (0.314-4.291)	0.824	1.362 (0.416-4.466)	0.610
Education Level						
Up to Diploma	1	1	1	1	1	1
Up to Bachelor	1.380 (0.775-2.458)	0.274	**1.962** (1.317-2.922)	**0.001**	1.221 (0.858-1.738)	0.268
Up to Postgraduate	0.847 (0.450-1.596)	0.608	**2.279** (1.351-3.842)	**0.002**	0.998 (0.651-1.528)	0.992
Profession type						
Nurses	1	1	1	1	1	1
General medical practitioner	1.473 (0.781-2.776)	0.231	**1.554** (1.013-2.384)	**0.044**	0.756 (0.524-1.091)	0.135
Specialist medical practitioner	0.965 (0.507-1.835)	0.913	**2.407** (1.377-4.208)	**0.002**	0.942 (0.614-1.446)	0.785
Work duration						

≤5	1	1	1	1	1	1
6-10	1.006 (0.563-1.798)	0.983	1.079 (0.721-1.614)	0.711	0.975 (0.683-1.392)	0.889
11-15	1.028 (0.438-2.415)	0.949	**2.337** (1.118-4.882)	**0.024**	1.059 (0.626-1.791)	0.832
≥16	0.456 (0.196-1.063)	0.069	0.650 (0.329-1.286)	0.216	1.198 (0.603-2.379)	0.606
Presence of dependent						
No dependent	1	1	1	1	1	
Dependent with no support	0.673 (0.346-1.308)	0.242	1.149 (0.683-1.933)	0.601	**1.617** (1.000-2.612)	**0.050**
Dependent with support	1.253 (0.707-2.222)	0.439	1.305 (0.880-1.935)	0.185	1.283 (0.907-1.815)	0.158
[a]**Previous training**						
No	1	1	1	1	1	1
Yes	1.653 (0.959-2.849)	0.070	1.090 (0.756-1.573)	0.644	1.147 (0. 829-1.585)	0.408
[a]**Previous experience**						
No	1	1	1	1	1	1
Yes	1.216 (0.714-2.070)	0.471	0.974 (0.673-1.411)	0.889	**1.857** (1.317-2.619)	**<0.001**
Trust in work safety						
Low	1	1	1	1	1	1
High	**3.284** (1.937-5.567)	**<0.001**	1.280 (0.825-1.987)	0.271	1.192 (0.800-1.774)	0.388
Trust in family preparedness						
Low	1	1	1	1	1	1
High	1.338 (0.756-2.369)	0.317	1.292 (0.850-1.963)	0.231	0.990 (.0674-1.454)	0.959
Trust in colleague's preparedness						
Low	1	1	1	1	1	1
High	**2.592** (1.401-4.795)	**0.002**	**1.974** (1.200-3.246)	**0.007**	1.392 (0.866-2.237)	0.172
Trust in hospital preparedness						
Low	1	1	1	1	1	1
High	1.392 (0.807-2.400)	0.234	1.212 (0.810-1.814)	0.351	1.158 (0.807-1.663)	0.426
[b]**Self-efficacy**	**1.358** (1.247-1.479)	**<0.001**	**1.184** (1.115-1.257)	**<0.001**	**1.135** (1.076-1.197)	**<0.001**

[a]Previous experience and training in disasters
[b]*Continuous measure, with one unit increase in self-efficacy*

Table 4: Multivariate association of adjusted professional and intrapersonal characteristics with willingness in any type of disaster, in natural disasters, or in influenza pandemic

Variable	Willingness to participate in any type of disasters		Willingness to participate in natural disasters		Willingness to participate in influenza pandemic	
	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value
Age						
≤30	1	1	1	1	1	1
31-45	1.137 (0.609-2.121)	0.687	1.432 (0.928-2.209)	0.105	1.008 (0.695-1.461)	0.967
≥46	0.440 (0.136-1.418)	0.169	1.087 (0.409-2.886)	0.867	1.062 (0.484-2.332)	0.880
Gender						
Female	1	1	1	1	1	1
Male	1.456 (0.807-2.628)	**0.212**	**1.639** (1.102-2.439)	**0.015**	1.131 (0.793-1.612)	0.498
Education Level						
Up to Diploma	-	-	1	1	-	-
Up to Bachelor	-	-	1.706 (0.993-2.932)	0.053	-	-
Up to Postgraduate	-	-	1.177 (0.522-2.657)	0.695	-	-
Profession type						
Nurses	1	1	1	1	1	1
General medical practitioner	1.285 (0.438-3.767)	0.261	1.581 (0.691-3.614)	0.278	0.751 (0.468-1.205)	0.235
Specialist medical practitioner	1.392 (0.578-3.352)	0.644	0.939 (0.515-1.713)	0.838	0.697 (0.473-1.026)	0.067
Presence of dependent						
No dependent	-	-	-	-	1	1
Dependent with no support	-	-	-	-	1.537 (0.910-2.598)	0.108
Dependent with support	-	-	-	-	1.154 (0.791-1.685)	0.457

[a]**Previous experience**						
No	-	-	-	-	1	1
Yes	-	-	-	-	**1.528** (1.058-2.207)	**0.024**
Trust in work safety						
Low	1	1	-	-	-	-
High	**2.535** (1.357-4.736)	**0.004**	-	-	-	-
Trust in colleague's preparedness						
Low	1	1	1	1	-	-
High	1.199 (0.576-2.496)	0.686	1.363 (0.791-2.351)	0.265	-	-
[b]**Self-efficacy**	**1.319** (1.197-1.453)	**<0.001**	**1.143** (1.069-1.221)	**<0.001**	**1.114** (1.050-1.182)	**<0.001**

[a]Previous experience and training in disasters

[b]*Continuous measure, with one unit increase in self-efficacy*

SECTION ONE:

Please tick (√) in the appropriate box

1. **Age:** _____

2. **Gender** :

   Male ☐ Female ☐

3. **Marital status:**

   Single ☐ Married ☐ Divorce ☐ Widow/er ☐

4. **Highest Education level completed :**

   Diploma ☐ Bachelor ☐ Masters ☐ Professional ☐

5. **What is your primary job category?**

   Specialist medical practitioner ☐ General medical practitioner ☐

   Nurse ☐

6. **Duration of work at the hospital:** _____ Years.

7. **Do you have any of the following responsibilities (you can choose more than one choice):**

Children ☐ Elders ☐ None ☐

8. **Do you have any one who can take care of the previously mentioned responsibilities in case of your absence?**

Yes ☐ No ☐

SECTION TWO

Please tick (√) in the appropriate box:

1. **Have you participated in a disaster before?**

Yes ☐ No ☐

2. **Have attended any previous disaster trainings?**

Yes ☐ No ☐

SECTION THREE:

Part A:

NO	Questions	Strongly disagree (1)	Disagree (2)	Somwwhat agree (3)	Agree (4)	Strongly agree (5)
1.	I am confident of my personal safety at work in case of a disaster.					

2.	I am assured that my family is prepared to function in in my absence during a disaster.					
3.	I am sure that my colleagues are able to perform their duties during a disaster.					
4.	The hospital is prepared to provide effective response in case of a disaster.					

PART B:

NO	Statement	Strongly disagree (1)	Disagree (2)	Somwwhat agree (3)	Agree (4)	Strongly agree (5)
1.	I am able to treat patients of different type of disasters.					
2.	I am confident that I can perform my role in the hospital following any type of disasters.					
3.	I feel that it is my duty to work in the event of a disaster.					
4.	I will be able to report to work at the hospital during an event of a disaster.					

SECTION FOUR:

NO	Statement	Strongly disagree (1)	Disagree (2)	Somwwhat agree (3)	Agree (4)	Strongly agree (5)
1.	I am willing to participate in any type of disaster regardless of its severity					
2.	I am willing to participate in natural disasters (earthquake, floods or cyclone)					
3.	I am you willing to participate in influenza pandemic					

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	Main document (l)
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	Main document (1)
Background /	#2	Explain the scientific background and rationale for the	Main document

rationale		investigation being reported	(3)
Objectives	#3	State specific objectives, including any prespecified hypotheses	Main document (4)
Study design	#4	Present key elements of study design early in the paper	Main document (4)
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Main document (4-6)
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	Main document (4)
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Main document (5), table1 (Page 18)
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for exposed and unexposed groups if applicable.	Main document (5)
Bias	#9	Describe any efforts to address potential sources of bias	Main document (13)
Study size	#10	Explain how the study size was arrived at	Main document (4,5)
Quantitative	#11	Explain how quantitative variables were handled in the	Main document

variables		analyses. If applicable, describe which groupings were chosen, and why	(6)
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	Main document (6)
	#12b	Describe any methods used to examine subgroups and interactions	Main document (6)
	#12c	Explain how missing data were addressed	Main document (6)
	#12d	If applicable, describe analytical methods taking account of sampling strategy	Main document (4, 6)
	#12e	Describe any sensitivity analyses	
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	Main document (4, 6)
	#13b	Give reasons for non-participation at each stage	Main document (4, 6, 13)
	#13c	Consider use of a flow diagram	
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if	Main document (7,8), table 2 (page 19, 20)

		applicable.	
	#14b	Indicate number of participants with missing data for each variable of interest	Table 2 (page 19, 20)
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	Main document (7), table 2 (page 19, 20)
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Main document (8, 9), table 3, 4 (page 21-23)
	#16b	Report category boundaries when continuous variables were categorized	Main document 5
	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	
Key results	#18	Summarise key results with reference to study objectives	Main document (6-9)
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	Main document (12, 13)
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results	Main document (9-12)

		from similar studies, and other relevant evidence.	
Generalisability	#21	Discuss the generalisability (external validity) of the study results	Main document (13)
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Main document (14)

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Factors associated with Healthcare Workers Willingness to Participate in Disasters: a cross-sectional study in Sana'a, Yemen

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Factors associated with Healthcare Workers Willingness to Participate in Disasters: a cross-sectional study in Sana'a, Yemen

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Contributorship statement:

- WA – conceptualized the study, conducted the data collection, analysis, and interpretation of data for the work; draft and approve the manuscript for publication.
- VCWH – conceptualized the study, interpretation of data for the work; revise and approve the manuscript for publication.
- KC – conceptualized the study, supervised the data analysis, interpretation of data for the work.

List of Abbreviations:

CI	Confidence Interval
HCW	Healthcare workers
IQR	Interquartile range
SD	Standard Deviation

Abstract

Objectives: Willingness to participate in disasters are usually overlooked and not addressed in disaster preparedness training courses to ensure health service coverage. This will lead to issues during the disaster's response. This study, therefore, aims to assess healthcare workers willingness to participate in biological and natural disasters, and to identify its associated factors.

Design: This is a cross-sectional study using a self-administered questionnaire. The questionnaire was distributed to 1093 healthcare workers. The data was analysed using multiple logistic regression with significance level $p<0.05$. Ethical clearance and consent of the participants were duly obtained.

Setting: In three public Hospitals that provide tertiary level healthcare in Sana'a City, Yemen.

Participants: There were 692 nurses and doctors (response rate 63.3%) completed the questionnaires.

Results: Almost half of the participants 55.1% were nurses and 44.9% were doctors. The study found that self-efficacy was associated with willingness to participate in disaster response for any type of disasters (Odds Ratio [OR]=1.328, 95% Confidence Interval [95%CI]: 1.206 to 1.464), natural disasters (OR=1.138, 95%CI: 1.064 to 1.217), and influenza pandemic (OR=1.112, 95%CI: 1.049 to 1.180). The results further show that willingness is associated with healthcare workers being young, male and having higher educational qualifications.

Conclusion: Self-efficacy has been found to be an important factor associated with willingness. Improving self-efficacy through training in disaster preparedness may increase willingness of healthcare workers to participate in a disaster.

Key words: Disaster preparedness; willingness; self-efficacy; intrapersonal; healthcare worker.

Strength and limitations of this study

- This study is the first study that attempts to assess Healthcare workers willingness to participate in different types of disasters in Sana'a City, Yemen.
- Implementing a cross-sectional design and using a convenience sample has made it difficult to establish causal association.
- The study sample represents healthcare workers in Sana'a City in terms of gender and locality.
- The face to face approach, which included introduction of the study and its objectives, ensured a higher response rate and minimised the risk of selection bias.

Introduction:

In various parts of the world, disasters destroy communities and infrastructures, causing huge material and human losses.[1] Similarly, hospitals and health centres are also affected by the disasters, which restrict its work of relieving disaster-stricken communities. By 2025, more than half of the world population will live in cities, particularly in urban cities located along seismic fault lines, flood and other natural disaster-prone areas.[2] Therefore, healthcare workers (HCW) should be prepared to manage the influx of patients during possibly life threatening circumstances. A healthcare worker is defined as "the one who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even medical waste handlers".[3]

According to the Global Facility for Disaster Reduction and Recovery (GFDRR), Yemen is one of the priority countries in the Middle East and North African region, mainly due to its vulnerability to disasters.[4-6] Natural disasters, which includes storms, landslides, earthquake and floods are recurrent in Yemen. Floods due to the monsoonal rainfall, is responsible for most of the mortality due to disasters.[6] Currently in Yemen, disaster management mainly focuses on responding to post disasters damage, and there is a lack of disaster preparedness, such as training and mock drills. The insufficient training makes it difficult to maintain preparedness.[4,7,8] A competent prepared healthcare worker could better mitigate and respond to the community health needs during crises, which in turn will elevate health outcomes.

During disasters, HCW are expected to provide health care assistance to people suffering from the disasters alongside with caring for their usual patients. Some are also required to care for their dependents. Most of the previous studies reported an anticipated decrease in health workforce during a disaster as not all HCW are willing to participate in a

disaster. Therefore, understanding the factors associated with willingness to participate in a disaster would allow more effective planning for a disaster situation. Systematic reviews have found that willingness was associated with factors like the nature and type of event; competing obligations between personal and professional needs; the work environment and climate including personal safety, and the relationship between knowledge and perceptions of efficacy.[9,10]

Disaster preparedness activities and routine disasters trainings have been found to improve the knowledge, skills and attitude preparedness of disasters.[11] However, the factors that affect the willingness to participate in disasters are beyond just having knowledge on disaster management.[9-12]

In a recent systematic review, they found only few studies that have been conducted in the Middle East on the willingness to participate in disasters. They recommend that further research should be conducted based on behavioural theories to better understand the Middle East context of willingness to participate in a disaster.[13] In another systematic review of 70 studies on HCW willingness to participate in disasters, only 12 studies were from Asia and none of those studies were from the Middle East.[11] Therefore, the objective of this study is to determine the associations between socio-demographic, professional, and intrapersonal factors associated with the doctors' and nurses' willingness to participate in disasters response in Sana'a, Yemen. The study factors are built based on the self-efficacy behavioural theory.

Methods:

Study design, population and instrument

This is a cross-sectional study conducted in three public hospitals in the Sana'a Governorate, Yemen; Al-Thora, Al-Jumhouri, and Al-Kuwait hospitals, which have more

than a total of 4,000 nurses and doctors, which is the focus of this study. Out of this, 1093 HCW were selected through convenient sampling by approaching the healthcare workers individually. The sample size calculation was determined using the OpenEpi software. It was based on a 95% confidence interval with a power of set to 80%. The sample size of 1093 was determined based on the variable "perception of responsibility to participate" from a pre-study, which is an element of the self-efficacy construct with the highest sample size to achieve an association.[14] The determined sample size was 614, which was inflated by 78 percent based on the lowest response rate of previous studies to reach 1093.[15]

The questionnaire was developed by the researcher based on information from previous studies and opinions of national and international experts (supplementary martials).[15-18] The questionnaire was pre tested for validity and reliability. The questionnaire was distributed to national and international experts together with questions on the validity of the questionnaire with a scale of 1 to 4 (1 not relevant to 4 highly relevant). It tested the questionnaire's consistency, relatedness, representativeness and clarity of wording. From the results of the pre-test, six items of the questionnaire that was related to the knowledge construct, was deleted and changes on the questions were reworded. The revised questionnaires were then forward and backward-translated form English to Arabic and from Arabic to English. Following that, three other HCW were asked to give their opinion on the questions based on the objective of the study.

The final questionnaire was pilot tested on 20 doctors and nurses from a hospital, other than hospitals that have been chosen for the study. The internal consistency was assessed using Cronbach's alpha. Self- efficacy was 0.801 and this is considered good inter-correlation. Therefore, the self-efficacy four items were used in the final survey to build the construct as one of the intrapersonal factors (unpublished).

The questionnaire consists of socio-demographic, professional, and intrapersonal factors, and willingness to participate in a disaster. The professional, intrapersonal and willingness questions were measured on a five-point Likert scale (1=strongly disagree, 2=disagree, 3=somewhat agree, 4=agree, and 5=strongly agree). A binary variable was created based on "less or equal two'' as low and" more than 2'' as high.

Self-efficacy theory

The self-efficacy theory was chosen to build the self-efficacy construct as it illustrates beliefs that drive actions to face and solve problems that are faced to achieve the intended goals. In case of disaster, the theory could be applied to HCW who are coping with fear and threat and adapting new behaviours because of their beliefs in their competences. This belief is derived from their successful performances, observing colleagues and managers positive behaviours, convincing by a superior person, and calming the physiological and emotional pressure caused by the threat.[19]

Data collection

Ethical approval was obtained from the Ministry of Health and Population of Yemen. Informed consent was obtained from the respondents and confidentiality of personal disclosures was re-assured. The self-administered questionnaires were distributed and retrieved between February and March 2018. A final 767 questionnaires were returned for analyses; 75 questionnaires were omitted due to missing values.

Statistical analysis

The data was analysed using Statistical Package for Social Science (SPSS) version 22. Descriptive outputs were generated describing the median, interquartile range, frequency

counts and percentages. Chi square test and multiple logistic regression was performed to test the hypothesis of the study on $p<0.05$ for all statistical tests. The variables selected to be included in the multivariate analysis were variables with $p<0.25$ in the univariate analysis, and gender, age, and type of profession were also included.

Patient and Public Involvement

Patients and the general public were not involved in the conduct of this research. HCW were involved during the pilot study in order to test the understanding of the written questionnaire. In addition, data was assessable by the researchers and is stored in a secure file in the computer and online storage.

Results:

Socio-demographics Characteristics

Responses were collected from 692 HCW (response rate 63.3%), where 311 (44.9%) were doctors and 381 (55.1%) were nurses. Most of the female participants were nurses at 64.5%. More doctors (56.6%) had >5 years of experience at their current place of work, as compared to nurses (40.9%). The average age of participants was 31.96 (Standard Deviation [SD] 7.46) years across the two occupations. Out of the 65.9% who had dependents, i.e., having to take-care of child or elderly persons, 73.9% reported to have support to care for their dependents in a case of a disaster. The percentages were almost equally distributed between doctors and nurses.

Professional and Intrapersonal Characteristics

Table 1 describes the socio-demographic, professional, intrapersonal, and willingness characteristics of respondents. Only 39.2% of the HCW had any previous training in dealing with disasters. This was the same for previous work experience, where only 35.8% of the participants had previous work experience in a disaster situation.

The doctors and nurses reported a high trust in work safety, in family, in colleague's preparedness to react, and in their hospital's preparedness to react in case of a disaster, with trust in colleague's preparedness as the highest percentage (88.3%). Similarly, HCW had a high median score (16; IQR 2) in self-efficacy construct.

Respondents' willingness

Ninety percent of the participants expressed high willingness to participate in any type of disasters. However, they were less willing to participate in natural disasters (77.3%) and influenza pandemic (66.0%) (Table 1).

[Table 1]

Analysis of Self-efficacy's factors

There were four items in the self-efficacy construct. After the data collection, the inter-correlation value of self- efficacy was tested before running the main analysis. The descriptive statistics and inter-item correlation values of the self-efficacy construct are presented in Table 2.

[Table 2]

Based on Table 2, there was a moderate level of agreement in all the four items. The highest correlation for each item with at least one other item in the construct was between 0.3 and 0.9. In factor analysis, the Kaiser-Meyer-Olkin (KMO) value was 0.658 ($p<0.001$), KMO value close to 1, so the variables are suitable for factor analysis. Therefore, a single factor was formed from the four items computed, and it was saved as incentive to be used in further analysis. Accordingly, to calculate the self- efficacy, four questions was asked. The sum outcome of the four answers ranged from 4 to 20 (Median 16, Interquartile range [IQR] 5).

Factors associated with willingness to participate in any type disaster

There was an association between participants' gender and willingness to participate in any type of disaster, with males being more willing compared to females (crude OR=2.161, 95%CI: 1.307 to 3.573) (Table 3). Those with high trust in work safety (crude OR=3.284, 95%CI: 1.937 to 5.567), trust in colleague's preparedness (crude OR=2.592, 95%CI: 1.401 to 4.795) and self-efficacy (crude OR=1.358; 95%CI: 1.247 to 1.479) were also found to be more willing to participate in any type of disaster in the univariate analysis (Table 3).

In the final model, having trust in work safety (adjusted OR=2.535, 95%CI: 1.357 to 4.736) and self-efficacy (adjusted OR=1.319, 95%CI: 1.197 to1.453) were found to be associated with general willingness with any type of disasters (Table 4).

Factors associated with willingness to participate in natural disaster

In the univariate analysis, there was an association between some of the socio-demographic characteristics (age, gender, education level, type of profession and work duration) with willingness to participate in natural disasters. Participants with bachelor and

postgraduate degrees had a higher odd of willingness to participate in natural disasters compared to those with a diploma education. Those in the age group of between 31 and 45 years were found to be more willing when compared to participants who were ≤30 years old. The main intrapersonal factors associated with willingness in natural disasters were participants' trust in colleagues' preparedness in case of a natural disaster, and self-efficacy (Table 3).

In multivariate, being male (adjusted OR=1.639, 95%CI: 1.102 to 2.439) and self-efficacy (adjusted OR=1.143, 95%CI: 1.069 to 1.221) were significantly associated with willingness to participate in natural disasters (Table 4).

Factors associated with willingness to participate in influenza pandemic disaster

For willingness to participate in an influenza pandemic, the univariate results revealed that being male, having a dependent with no support (compared to participants without a dependent), having previous experience and self-efficacy were associated with willingness to participate in a pandemic (Table 3).

In the final model, having previous experience (adjusted OR=1.528, 95%CI: 1.058 to 2.207) and self-efficacy (adjusted OR=1.114, 95%CI: 1.050 to 1.182) were found to be associated with willingness to participate in influenza pandemic (Table 4).

[Table 3, Table 4]

Discussion:

The study's main question is to test the strength and direction of the association between the independent variables- socio-demographic, professional, and intrapersonal variables- with the variables of willingness to participate in three different types of disasters. The results showed that trust in work safety and self-efficacy were associated with disaster participation willingness after in the multivariate analysis. Gender and self-efficacy were found to be significantly associated with willingness to participate in natural disasters. However, previous experience and self-efficacy were statistically significant with willingness of HCW to participate in an influenza pandemic.

It is difficult to obtain a one hundred percent participation of HCW even though it is vital in case of disasters. Previous studies suggested that between 65 and 97 percent of HCW were willing to participate in a natural disaster, and between 54 and 86 percent in an influenza pandemic.[11,16,20,21] The reason for this difference in the levels of willingness between the two types of disasters is due to the great distinction in their nature. The outcome of the interaction between HCW and the socio-environmental determinants of these disasters leads to having different willingness levels. According to Connor et al., (2014) the weighted risk resulting from this interaction plays a major role in HCW willingness.[10] In the case of pandemics, the fear of the inability to control biohazards and watching colleagues acquiring a communicable disease after contact with affected persons was a suggested reason for the low willingness levels.[10] Another qualitative study in Australia highlighted that in different types of disasters emergency nurses' willingness to attend to work is shaped by the weighted risk to self and surrounding people and the pressure formed from the period dealing with the disaster.[12] Natural disasters may not directly affect HCW or their families like the influenza

pandemic which may be a reason for the higher level of willingness to attend to work compared to pandemics.

The findings of this study are consistent with the previous studies regarding their willingness level to different types of disasters. More HCW were willing to participate in natural disasters (77.3%) as compared to influenza pandemics (66.0%). Nevertheless, even though there was a higher percentage of HCW willingness in this study to participate in both types of disasters compared to other studies, Yemen's high vulnerability, due its topography and current economic, political and health status, could affect the country's health status and cause huge adverse health impacts when disasters occur. According to the Vulnerability Matrix, one third of Yemen's districts are highly vulnerable.[5]

Subsequently, due to the armed conflicts in Yemen that started in early 2015, it has become difficult to deal with any disaster that may occur. According to the World Health Organization (WHO), the healthcare system in Yemen is in a critical situation with about 50% of the health facilities in Yemen being either partially or totally damaged as a result of the natural disasters and conflicts. Furthermore, of the 3,507 healthcare facilities in Yemen, almost 300 healthcare facilities have been destroyed.[5,22] Therefore, any possible decrease in the health work force during disasters in Yemen must be considered. The existing drained health sector is based on a vulnerable health system in terms of its structure and healthcare staff number and distribution in the country.[23] Thus, training and preparing healthcare staff to act during disasters is critical and could help achieve Priority 4 in the United Nations' Sendai Framework for Disaster Risk Reduction 2015-2030 in enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction of disasters, and further prevent any possible humanitarian catastrophe.[24]

The results show that willingness to participate in events of natural disasters may be encouraged by many suggested factors. Factors such as respondents being male are

accompanied with higher willingness to participate in natural disasters. The findings are similar to previous studies conducted in Jordan, China and the United States of America.[15,16,25,26] However, having less female health workers who are willing to participate in disasters highlight a need to address this group during health preparedness programs. This lack in female HCW willingness could be due to the gender and cultural barriers in Yemen. These barriers need to be addressed to better motivate female workers participation in disasters. This is an important area for research as studies on willingness are moving forward.

As noted in previous studies, nurses and doctors with previous experience in influenza pandemics are ever willing to participate in influenza pandemics.[14, 25] HCW who have experience working with previous disaster have a better knowledge in disaster management, copping strategies, and ways to protect themselves and their families; which may be a reason for having higher odds of willingness to participate. According to Alzahrani et al., (2017) most of the nurses have a higher level in Mass gatherings management such as communicating effectively during emergencies in Saudi Arabia due to Previous experience.[27] He also found a need for further trainings by the nurses. Similarly, Chokshi et al., (2008) found that simulation training, attending conferences and previous experience increase paediatric surgeons' feeling of preparedness.[14]

This study found that the trust in work safety during any type of disaster plays a key role in the willingness to participate, which is similar to the results from previous studies.[11,25,28] Work safety is important in order for HCW to feel safe and do their work. A study by Stergachis et al., (2011) found that the majority of the participants reported their fear or concern for self in case of influenza pandemic and during earthquake scenarios as one of the major barriers to willingness to participate.[29] In Yemen, work safety in disaster preparedness is concerning after notifications made by Aladhrai et al.,(2015) and Naser et al., (2018) on the current low work place safety and the needs of increasing safety and

security standards in Yemen's Health establishments.[7,8] Whether it is external or internal catastrophe, unsafe work place could lead to increase optional absenteeism during disaster. Thus, disseminating information on work safety and protection devices during several types of disasters is advisable.

Many studies have established the association between self-efficacy and willingness to participate in disasters.[10,15,16] Similarly, this study has identified that self-efficacy plays an important role in the willingness to participate in natural disasters, in influenza pandemic and any type of disasters. It indicates that elements tested for self-efficacy like participants increase in familiarity with their role, responsibility to react, and being confident of their ability to deal with various types of disasters could be a key factor to increase HCW self-efficacy. Thus, their willingness to participate will also increase. Disaster preparedness trainings are encouraged to contain materials that explain the responses to the different types of disasters, doctors' and nurses' role in disasters and how it makes a difference in responding to disasters. Supportive measures to increase HCW self-efficacy such as immediate communication with much needed information and rewards for efforts in disasters are suggested.

Although the study faced challenges in the collection of data during the political unrest in the country, data was collected from three of the major public hospitals. The quality of data was ensured by researcher explaining the study and its objectives and answering any questions that may arise. This prevented differences in understanding the questions and increased participants' inclusion in the study. All in all, the study suggested the vital value of increasing self-efficacy and its elements in order to obtain more willingness participants.

Strengths and limitations

This is the first study to explore the patterns and associated factors of the willingness status to participate in disasters among healthcare workers in Yemen. The response rate was also high as the questionnaire was distributed personally by the researcher. The questionnaire was pilot tested to ensure the validity of the questionnaire.

This study had some limitations. As the study was performed under a political insecurity/fragile state of the country and a list of workers of HCW working at the hospitals was difficult to obtain. As a result, a universal sample was undertaken which could limit the study of representativeness. This is a cross-sectional study using a self-administered questionnaire, where the actual willingness of the respondents cannot be ascertained. The respondents may answer positively due to social desirability bias. Other than the self-administrated questionnaire limitations, the findings of the study are limited to staff working at the tertiary level public hospitals in urban areas of Yemen.

Conclusion:

Increasing the likelihood of willingness to participate in disasters play a key role in guarantying the optimum number of work force. This study indicates that one's socio-demographic, professional and intrapersonal factors play a role in increasing his/her willingness in general and across different types of disasters. Significant differences were revealed between participants' willingness in natural disasters by gender and self-efficacy, and participant's willingness in influenza pandemics by previous experience and self-efficacy. This result suggests integrating disaster management to doctors' and nurses' in the early stages of their educational curriculums. This could be achieved by adding early

exposure of healthcare workers to relevant disaster experiences which would further boost their willingness to participate in disaster response.

Other areas for preparedness may include increasing hospitals safety and resilience; hence that willingness to participate in natural disasters' response was influenced by the demographic characteristic of the healthcare personnel. Additionally, others found outside the bracket should be motivated to participate with a reward package such as incentives and hazard allowance. Further studies should also be conducted in both urban and rural settings with a relatively peaceful atmosphere.

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Data sharing statement: This is an anonymous gathered survey; the data are the responses from the participants. The data have been grouped and presented in the manuscript.

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Table 1: Socio-demographic, professional, intrapersonal, and willingness

Characteristics of Respondents

Variable		Frequency (n= 692)	Percentage (%)
Age (years)	≤30	360	52.0
	31-45	294	42.5
	≥46	38	5.5
Gender	Male	419	60.5
	Female	273	39.5
Marital-status	Single	258	37.3
	Married	420	60.7
	Divorce	8	1.2
	Widow	6	0.9
Education-level	Diploma	280	40.5
	Bachelor	275	39.7
	Post graduate education	137	19.8
	Master	104	15.0
	Professional	33	4.8
Profession type	Doctors	311	44.9
	Specialist medical practitioner	126	8.2
	General medical practitioner	185	26.7
	Nurses	381	55.1
Work duration (years)	≤5	360	52
	6-10	213	30.8
	11-15	76	11.0
	≥16	43	6.2
Dependent	With dependent	456	65.9
	Elder	65	9.4
	Child	276	39.9
	Both	115	16.6
	No dependent	236	34.1
[a]Support	No	119	26.1
	Yes	337	73.9
[b]Previous training	With previous training	271	39.2
	Without previous training	421	60.8
[b]Previous experience	With previous experience	248	35.8
	Without previous training	444	64.2
Trust in work safety in case of disaster	High trust in work safety	563	81.4
	Low trust in work safety	129	18.6
Trust in family preparedness in case of a disaster	High trust in family preparedness	544	78.6
	Low trust in family preparedness	148	21.4
Trust in colleague preparedness to react in disaster	High trust in colleague preparedness	611	88.3
	Low trust in colleague preparedness	81	11.7

Trust in hospital preparedness to react in disaster	High trust in hospital preparedness	522	75.4
	Low trust in hospital preparedness	170	24.6
Self-efficacy score (Median; Inter-Quartile)		16	5
Willingness to participate in Any type of disaster	High	623	90.0
	Low	69	10.0
Willingness to participate in Natural disaster	High	535	77.3
	Low	157	22.7
Willingness to participate in Influenza and Pandemic	High	457	66.0
	Low	235	34.0

[a]*Only for participants with dependants. The percentages are only within participants with dependents.*
[b]*Previous experience and training in disasters*

Table 2: Descriptive statistics and inter-term correlation for items in self-efficacy

Items	Descriptive statistics		Inter-item correlation			
	Mean	SD	item 1	item 2	item 3	item 4
Item 1: Ability to perform work	3.36	1.074	1.000	0.592	0.267	0.259
Item 2: Familiarity with their role	3.62	1.085	0.592	1.000	0.325	0.324
Item 3: Responsibility to participate	4.23	0.929	0.267	0.325	1.000	0.390
Item 4: Ability report to work	4.03	1.062	0.259	0.324	0.390	1.000

Table 3: Univariate association of crude socio-demographic, professional and intrapersonal characteristics with willingness in any type of disaster, in natural disasters, or in influenza pandemic

Variable	Willingness to participate in any type of disasters		Willingness to participate in natural disasters		Willingness to participate in influenza pandemic	
	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value
Age						
≤30	1	1	1	1	1	1
31-45	1.056 (0.628-1.775)	0.838	**1.639** (1.126-2.387)	**0.010**	1.138 (0.822-1.576)	0.437
≥46	0.733 (0.269-1.997)	0.544	1.967 (0.798-4.850)	0.142	1.354 (0.650-2.820)	0.418
Gender						
Female	1	1	1	1	1	1
Male	**2.161** (1.307-3.573)	**0.003**	**2.254** (1.571-3.234)	**<0.001**	**1.505** (1.093-2.072)	**0.012**
Marital status						
Single	1	1	1	1	1	1
Married	0.899 (0.532-1.521)	0.692	1.128 (0.781-1.629)	0.521	1.090 (0.787-1.510)	0.605
Divorce and widow	0.615 (0.130-2.913)	0.541	1.160 (0.314-4.291)	0.824	1.362 (0.416-4.466)	0.610
Education Level						
Up to Diploma	1	1	1	1	1	1
Up to Bachelor	1.380 (0.775-2.458)	0.274	**1.962** (1.317-2.922)	**0.001**	1.221 (0.858-1.738)	0.268
Up to Postgraduate	0.847 (0.450-1.596)	0.608	**2.279** (1.351-3.842)	**0.002**	0.998 (0.651-1.528)	0.992
Profession type						
Nurses	1	1	1	1	1	1
General medical practitioner	1.473 (0.781-2.776)	0.231	**1.554** (1.013-2.384)	**0.044**	0.756 (0.524-1.091)	0.135
Specialist medical practitioner	0.965 (0.507-1.835)	0.913	**2.407** (1.377-4.208)	**0.002**	0.942 (0.614-1.446)	0.785
Work duration						

≤5	1	1	1	1	1	1
6-10	1.006 (0.563-1.798)	0.983	1.079 (0.721-1.614)	0.711	0.975 (0.683-1.392)	0.889
11-15	1.028 (0.438-2.415)	0.949	**2.337** (1.118-4.882)	**0.024**	1.059 (0.626-1.791)	0.832
≥16	0.456 (0.196-1.063)	0.069	0.650 (0.329-1.286)	0.216	1.198 (0.603-2.379)	0.606
Presence of dependent						
No dependent	1	1	1	1	1	
Dependent with no support	0.673 (0.346-1.308)	0.242	1.149 (0.683-1.933)	0.601	**1.617** (1.000-2.612)	**0.050**
Dependent with support	1.253 (0.707-2.222)	0.439	1.305 (0.880-1.935)	0.185	1.283 (0.907-1.815)	0.158
[a]**Previous training**						
No	1	1	1	1	1	1
Yes	1.653 (0.959-2.849)	0.070	1.090 (0.756-1.573)	0.644	1.147 (0. 829-1.585)	0.408
[a]**Previous experience**						
No	1	1	1	1	1	1
Yes	1.216 (0.714-2.070)	0.471	0.974 (0.673-1.411)	0.889	**1.857** (1.317-2.619)	**<0.001**
Trust in work safety						
Low	1	1	1	1	1	1
High	**3.284** (1.937-5.567)	**<0.001**	1.280 (0.825-1.987)	0.271	1.192 (0.800-1.774)	0.388
Trust in family preparedness						
Low	1	1	1	1	1	1
High	1.338 (0.756-2.369)	0.317	1.292 (0.850-1.963)	0.231	0.990 (.0674-1.454)	0.959
Trust in colleague's preparedness						
Low	1	1	1	1	1	1
High	**2.592** (1.401-4.795)	**0.002**	**1.974** (1.200-3.246)	**0.007**	1.392 (0.866-2.237)	0.172
Trust in hospital preparedness						
Low	1	1	1	1	1	1
High	1.392 (0.807-2.400)	0.234	1.212 (0.810-1.814)	0.351	1.158 (0.807-1.663)	0.426
[b]**Self-efficacy**	**1.358** (1.247-1.479)	**<0.001**	**1.184** (1.115-1.257)	**<0.001**	**1.135** (1.076-1.197)	**<0.001**

[a]Previous experience and training in disasters
[b]*Continuous measure, with one unit increase in self-efficacy*

Table 4: Multivariate association of adjusted professional and intrapersonal characteristics with willingness in any type of disaster, in natural disasters, or in influenza pandemic

Variable	Willingness to participate in any type of disasters		Willingness to participate in natural disasters		Willingness to participate in influenza pandemic	
	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value	Odds ratio (95% C.I.)	p-value
Age						
≤30	1	1	1	1	1	1
31-45	1.137 (0.609-2.121)	0.687	1.432 (0.928-2.209)	0.105	1.008 (0.695-1.461)	0.967
≥46	0.440 (0.136-1.418)	0.169	1.087 (0.409-2.886)	0.867	1.062 (0.484-2.332)	0.880
Gender						
Female	1	1	1	1	1	1
Male	1.456 (0.807-2.628)	**0.212**	**1.639** (1.102-2.439)	**0.015**	1.131 (0.793-1.612)	0.498
Education Level						
Up to Diploma	-	-	1	1	-	-
Up to Bachelor	-	-	1.706 (0.993-2.932)	0.053	-	-
Up to Postgraduate	-	-	1.177 (0.522-2.657)	0.695	-	-
Profession type						
Nurses	1	1	1	1	1	1
General medical practitioner	1.285 (0.438-3.767)	0.261	1.581 (0.691-3.614)	0.278	0.751 (0.468-1.205)	0.235
Specialist medical practitioner	1.392 (0.578-3.352)	0.644	0.939 (0.515-1.713)	0.838	0.697 (0.473-1.026)	0.067
Presence of dependent						
No dependent	-	-	-	-	1	1
Dependent with no support	-	-	-	-	1.537 (0.910-2.598)	0.108
Dependent with support	-	-	-	-	1.154 (0.791-1.685)	0.457

[a]**Previous experience**						
No	-	-	-	-	1	1
Yes	-	-	-	-	**1.528** (1.058-2.207)	**0.024**
Trust in work safety						
Low	1	1	-	-	-	-
High	**2.535** (1.357-4.736)	**0.004**	-	-	-	-
Trust in colleague's preparedness						
Low	1	1	1	1	-	-
High	1.199 (0.576-2.496)	0.686	1.363 (0.791-2.351)	0.265	-	-
[b]**Self-efficacy**	**1.319** (1.197-1.453)	**<0.001**	**1.143** (1.069-1.221)	**<0.001**	**1.114** (1.050-1.182)	**<0.001**

[a]Previous experience and training in disasters

[b]*Continuous measure, with one unit increase in self-efficacy*

SECTION ONE:

Please tick (√) in the appropriate box

1. **Age:** _____

2. **Gender** :

   Male ☐ Female ☐

3. **Marital status:**

   Single ☐ Married ☐ Divorce ☐ Widow/er ☐

4. **Highest Education level completed :**

   Diploma ☐ Bachelor ☐ Masters ☐ Professional ☐

5. **What is your primary job category?**

   Specialist medical practitioner ☐ General medical practitioner ☐

   Nurse ☐

6. **Duration of work at the hospital:** _____ Years.

7. **Do you have any of the following responsibilities (you can choose more than one choice):**

Children ☐ Elders ☐ None ☐

8. **Do you have any one who can take care of the previously mentioned responsibilities in case of your absence?**

Yes ☐ No ☐

SECTION TWO

Please tick (√) in the appropriate box:

1. **Have you participated in a disaster before?**

Yes ☐ No ☐

2. **Have attended any previous disaster trainings?**

Yes ☐ No ☐

SECTION THREE:

Part A:

NO	Questions	Strongly disagree (1)	Disagree (2)	Somwwhat agree (3)	Agree (4)	Strongly agree (5)
1.	I am confident of my personal safety at work in case of a disaster.					

2.	I am assured that my family is prepared to function in in my absence during a disaster.					
3.	I am sure that my colleagues are able to perform their duties during a disaster.					
4.	The hospital is prepared to provide effective response in case of a disaster.					

PART B:

NO	Statement	Strongly disagree (1)	Disagree (2)	Somwwhat agree (3)	Agree (4)	Strongly agree (5)
1.	I am able to treat patients of different type of disasters.					
2.	I am confident that I can perform my role in the hospital following any type of disasters.					
3.	I feel that it is my duty to work in the event of a disaster.					
4.	I will be able to report to work at the hospital during an event of a disaster.					

SECTION FOUR:

NO	Statement	Strongly disagree (1)	Disagree (2)	Somwwhat agree (3)	Agree (4)	Strongly agree (5)
1.	I am willing to participate in any type of disaster regardless of its severity					
2.	I am willing to participate in natural disasters (earthquake, floods or cyclone)					
3.	I am you willing to participate in influenza pandemic					

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	Main document (l)
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	Main document (1)
Background /	#2	Explain the scientific background and rationale for the	Main document

rationale		investigation being reported	(3)
Objectives	#3	State specific objectives, including any prespecified hypotheses	Main document (4)
Study design	#4	Present key elements of study design early in the paper	Main document (4)
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Main document (4-6)
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	Main document (4)
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Main document (5), table1 (Page 18)
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for exposed and unexposed groups if applicable.	Main document (5)
Bias	#9	Describe any efforts to address potential sources of bias	Main document (13)
Study size	#10	Explain how the study size was arrived at	Main document (4,5)
Quantitative	#11	Explain how quantitative variables were handled in the	Main document

variables		analyses. If applicable, describe which groupings were chosen, and why	(6)
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	Main document (6)
	#12b	Describe any methods used to examine subgroups and interactions	Main document (6)
	#12c	Explain how missing data were addressed	Main document (6)
	#12d	If applicable, describe analytical methods taking account of sampling strategy	Main document (4, 6)
	#12e	Describe any sensitivity analyses	
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	Main document (4, 6)
	#13b	Give reasons for non-participation at each stage	Main document (4, 6, 13)
	#13c	Consider use of a flow diagram	
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if	Main document (7,8), table 2 (page 19, 20)

		applicable.	
	#14b	Indicate number of participants with missing data for each variable of interest	Table 2 (page 19, 20)
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	Main document (7), table 2 (page 19, 20)
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Main document (8, 9), table 3, 4 (page 21-23)
	#16b	Report category boundaries when continuous variables were categorized	Main document 5
	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	
Key results	#18	Summarise key results with reference to study objectives	Main document (6-9)
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	Main document (12, 13)
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results	Main document (9-12)

		from similar studies, and other relevant evidence.	
Generalisability	#21	Discuss the generalisability (external validity) of the study results	Main document (13)
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Main document (14)