ORIGINAL RESEARCH

Effectiveness of a Primary Health Care Program on Urban and Rural Community Disaster Preparedness, Islamic Republic of Iran: A Community Intervention Trial

Ali Ardalan, MD, PhD, Hani Mowafi, MD, MPH, Hossein Malekafzali Ardakani, MD, MPH, PhD, Farid Abolhasanai, MD, Ali-Mohammad Zanganeh, MD, Hossein Safizadeh, MD, Sirous Salari, MD, MPH, and Vahid Zonoobi, MD, MPH

ABSTRACT

Background: To evaluate the effectiveness of a capacity-building intervention administered through a primary health care (PHC) system on community disaster preparedness in Iran.

Methods: A controlled community intervention trial with pre- and postassessments was conducted in 2011 in 3 provinces of Iran. In each province, 2 areas were chosen and randomly selected as an intervention or control group. A total of 9200 households were in the intervention area and 10 010 were in the control area. In each study group in each province 250 households were sampled for pre- and postassessment surveys. Community health volunteers led by PHC staff administered an educational intervention covering elements of hazard awareness and preparedness, with a focus on earthquakes and floods. Relative changes for awareness and readiness scores were assessed to demonstrate changes in outcome variables from pre- to postassessments in intervention and control groups. An effectiveness test of significance was based on interaction between time and area.

Results: Households in intervention communities exhibited improved disaster awareness and readiness with respect to all outcome measures. Relative changes in awareness in intervention and control areas were 2.94 and -0.08, respectively ($P<.001$). Relative changes for readiness scores were 5.52 in intervention areas and 0.56 in control areas ($P<.001$). Relative changes for awareness and readiness were significantly correlated with a community's baseline risk perception and previous experience with natural disasters ($P<.001$).

Conclusions: An educational intervention administered through the PHC system effectively improved disaster awareness and readiness at a community level. For sustainability, community disaster reduction programs must be integrated into routine public health service delivery. (*Disaster Med Public Health Preparedness*. 2013;7:481-490)

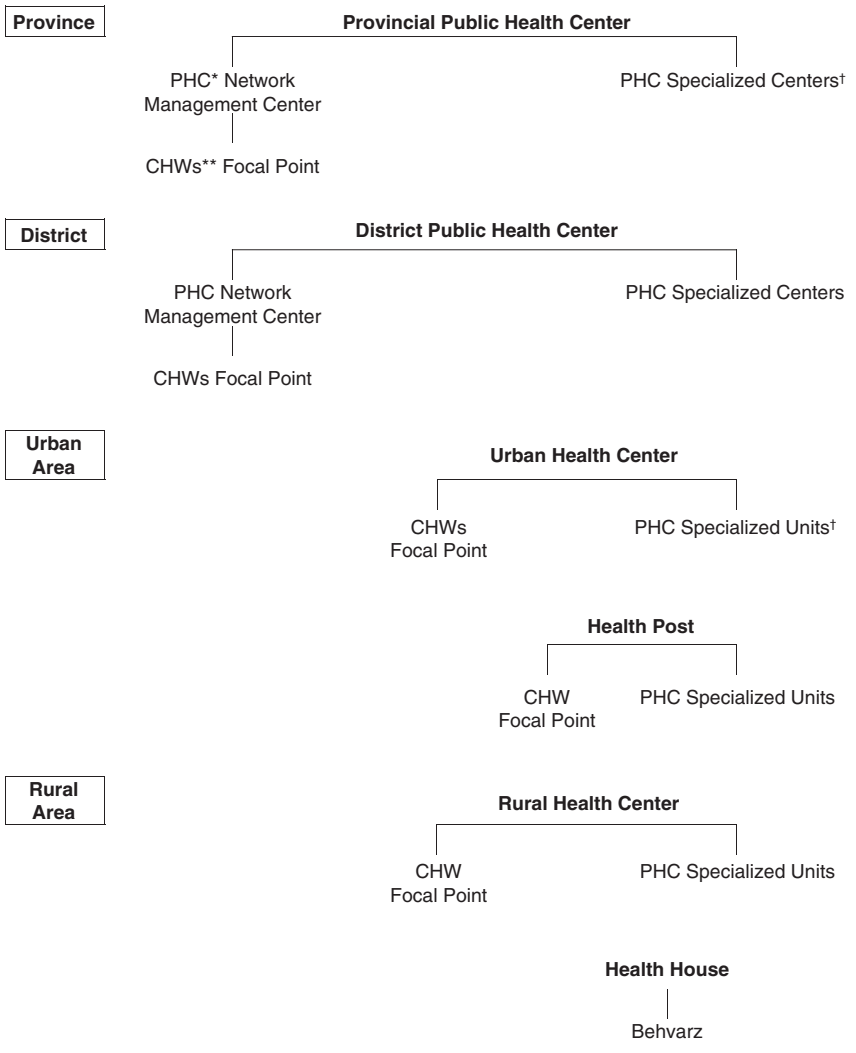
Key Words: disaster, preparedness, primary health care, Iran

The Islamic Republic of Iran is one of the most disaster-prone in the world. Its 75 million citizens are highly vulnerable to several types of natural hazards including earthquakes, floods, drought, and sandstorms. According to the Global Assessment Report (GAR) on Disaster Risk Reduction, Iran's risk class is 8 of 10.[1] For the 3 decades leading up to 2010, natural disasters accounted for more than 3000 deaths and affected 1.5 million persons per year in Iran. While earthquakes accounted for the greatest mortality and economic damage, drought was the most widespread, affecting the greatest number of people. Flood was ranked second in all categories of mortality, economic damages, and total number of people affected.[2] In a country with such frequent and widespread exposure to natural disasters, community awareness, preparedness, and management of disasters is a primary public health concern.[3,4]

In addition to preparing for response to disasters, Iran's health system has taken a proactive approach to disaster risk reduction. Advocacy and training programs have been developed on disaster resilience and preparedness at the community level to be delivered through its primary health care (PHC) network of 18 000 health houses (the most basic unit of health service delivery) and 6500 urban and rural health centers around the country[5] (Figure 1).

FIGURE 1

A View of the Primary Health Care Network in the Islamic Republic of Iran.



*PHC: Primary health care, **CHW: Community Health Worker, †PHC Specialized Centers/Units includes: Disease control, Environmental health, Mental health, Nutrition, Health Education & Promotion, Population, Family & School Health*

Abbreviations: PHC, primary health care; CHW, community health worker. PHC specialized centers/units include disease control, environmental health, mental health, nutrition, health education and promotion, population, family and school health.

Numerous studies have described the preparedness of the communities for disasters. However, based on a comprehensive search of PubMed and Google Scholar, few population-based interventional studies in the literature demonstrate the effectiveness of a public health program on natural disaster preparedness.[6,7] In this population-based study, we assessed the effectiveness of an educational intervention using the primary health system to enhance community awareness and readiness for natural disasters in Iran.

METHODS

In 2011, a community intervention trial was conducted in selected areas of Kerman, Tehran, and Golestan provinces in Iran. In consultation with local authorities, 2 study areas were identified in each province and randomly assigned as an intervention or control area. All areas selected had similar hazard profiles and socioeconomic characteristics. In addition, the 2 study areas chosen within each province had enough geographic distance between them to limit the

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TABLE 1

Characteristics of Intervention and Control Areas

Province	Study Group	Location	No. of Households	Name of Area
Kerman	Intervention	Urban	1330	Baghodrat-e-Joopari
		Rural	914	Ghanteghestan, Langar
	Control	Urban	1769	Razi
		Rural	1147	Kahnooj-e-Modim, Shahrokhabad, Hojatabad
Golestan	Intervention	Urban	1982	Fazel-Abad
		Rural	1317	Rahmatabad, Golestan
	Control	Urban	1649	Neginshahr
		Rural	1443	Azdartapeh, Fazelabad, Khandoozsadat
Tehran	Intervention	Urban	2250	Mahdieh
		Rural	1407	Irin, Bahramabad, Hoseinabad
	Control	Urban	2705	Alghadir
		Rural	1297	Ghasemabad
Total	Intervention	Urban	5562	
		Rural	3638	
	Control	Urban	6123	
		Rural	3887	

transfer of *intervention* materials from the intervention to control areas. No interference with baseline community education efforts occurred in the study areas.

In each of the selected areas, a defined population was chosen from the catchment area of an urban health center (UHC) or a rural health center (RHC). The number of households in the urban and rural intervention areas were 5562 and 3638, respectively (total, 9200), and the number of households in the control area were 6123 and 3887, respectively (total, 10 010) (Table 1).

Intervention Program

A community education intervention for disaster awareness and preparedness was designed to resemble the format of the other health education programs of the PHC system. The intervention was administered by local PHC staff and community health workers (CHW) affiliated with PHC centers.

A study team was developed that included the heads of each PHC center; focal points for the CHW program; and the CHWs and *behvarz* health workers who conduct public health messaging in rural areas of Iran. Each PHC team underwent a 2-day training workshop and was provided with a training manual for reference.

The intervention was piloted in 2 phases. The first was in 5 households in the capital Tehran. The intervention materials were then revised and piloted in 5 households in each of the selected provinces. Additional revisions were made to the educational package before the study launch.

The community education program was conducted in 1 of 2 formats: (1) in the household intervention, members of the study team conducted a 45-minute training with 1 of the heads of each household (most frequently a female member) and encouraged that person to share the training with the rest of the household; or (2) in a local community center, such as the local mosque, a 90-minute group intervention was conducted. The second format was used to capture households that were not accessible for individual training. Both training formats had the same educational content; however, it was found that a longer period was required to cover the materials in the group training sessions. Slightly less than half of households (43%) also received color posters showing family all-hazard and earthquake- and flood-specific preparedness activities. A caricaturist was hired to paint the pictures (online supplement).

The intervention educational package included the discussion of (1) the health consequences of earthquake and flood hazards to individuals and households; (2) participatory risk mapping; (3) household emergency planning—including the importance of conducting a preparedness meeting, having a communication plan, preparing an emergency kit with emergency personal information card, and having a plan for vulnerable groups in the household; and (4) drill performance.

A flood risk map was expected to illustrate the routes of potential flood threat, house location, safe spots, and evacuation routes. An earthquake risk map was expected to show the overall space of a house, highlighting the safe and at-risk spots inside a house during an earthquake. Blank space around the maps was used to fill in other important information such as elements of emergency supplies, names of vulnerable members of a household, and emergency contact information. Households were asked to post the maps on a wall or refrigerator inside their own houses.

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The emergency personal information card was defined as a card included in the emergency kit consisting of information about household members such as blood group, important diseases, and medical considerations.

Training the study team, piloting the intervention, and launching the community education program across the 3 intervention areas took a total of 6 months.

Outcome Variables

Outcome variables were household awareness and readiness scores regarding common natural disasters. Each score was the nonweighted aggregate score of the corresponding questionnaire. Each score was normalized to 100. A score ratio was used to demonstrate the changes in each of these scores over time.

Table 2 lists the awareness and readiness components used. Awareness assessment included all-hazard preparedness (5 components) and specific preparedness about the 2 most important types of disasters in Iran: earthquake (4 components) and flood (3 components). Each awareness components included several questions (82 in total). The readiness assessment addressed 7 preparedness activities undertaken by households.

Other Study Variables

Demographic and socioeconomic data were collected to assess the comparability of the selected regions and the relationships to community awareness and readiness (Table 3). To adjust for the effect of previous experience with natural disasters, additional variables of interest were collected for inclusion in the multivariate analysis. These included whether the respondent had experienced a natural disaster or suffered damages (physical or financial) from a natural disaster in the last 10 years, and a self-report of the respondents' overall disaster risk perception.

Respondents' disaster risk perception was assessed through a set of 4 questions: in the event of a disaster within the next year, how worried might they be about (1) serious injury or death to themself, (2) serious injury or death to their loved ones, (3) significant damage to their home, and (4) damage to their valued possessions (excluding the home). The answers were scored from 1 (low) to 3 (high), and an aggregated measure of risk perception was obtained by summing the 4 scores.

Data Collection Method and Instrument

Using the study questionnaire, a pilot survey of 10 households (5 interventions and 5 controls) in each province was conducted (total, 30). The questionnaire content and face validities were assessed, and the Cronbach alpha for the awareness and readiness questions was estimated at 0.78 and 0.79, respectively.

Interviewers were PHC personnel who were trained in the questionnaire, study protocol, and interview skills. Each study interview lasted 30 minutes. Most often, the interviewee was the female head of the household, unless there was a single, divorced, or separated family without a wife, in which case the head of the household or other informed person older than age 18 years was interviewed. If subjects were not at home at the time of the attempted interview, up to 2 additional visits were made.

The survey measured the responses by interviewees for all measures except the risk mapping and provision of emergency kits, which were assessed through direct observation by the data collection team.

Sampling Method and Procedures

The household was the survey unit and was defined as a group of people living together under 1 roof. In the preassessment survey of each intervention and control population, 250 households were systematically sampled using registries of households available at the corresponding primary health center to obtain a baseline survey of disaster awareness and readiness activities. Similar sampling was conducted to yield a different set of 250 households in each community to receive the postassessment survey. The result was a systematic sampling of 1500 households for the baseline survey and 1500 households for the postassessment survey, for a total of 3000 household surveys. The baseline and postassessment surveys were performed in early April and late September of 2011, respectively.

Statistical Analysis

A score of 1 was given for each correct answer or activity undertaken. A score of 0 was assigned to incorrect answers or for no activity undertaken. Unsure answers were coded as 0 by default. Equal weight was given to each awareness question and readiness activity. A raw score was tallied for awareness and for readiness by a simple sum of all the component scores for each domain. Finally, both awareness raw scores and readiness raw scores were normalized on a 100-point scale.

To demonstrate the change of outcome variables over time in each study area, we calculated the relative change for awareness and readiness scores using the following formula:

$$\textit{Relative change} = (\textit{Postassessment score} - \textit{Preassessment score}) / \textit{Preassessment score}$$

Intervention effectiveness was measured by comparing relative changes in the intervention area to relative changes in the control area. The effectiveness test of significance was based on interaction between time and area. Linear and logistic regression models were applied for this purpose, and the models were adjusted for background variables with difference over assessment times or study areas. $P < .05$ was considered statistically significant. The software for statistical analysis was SPSS 11.0.

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TABLE 2

Outcome Variables in Intervention and Control Areas

	Intervention			Control			
	Preassessment	Postassessment		Preassessment	Postassessment		
Outcome Variables	**Mean (SD)**	**Mean (SD)**	**Relative Change[a]**	**Mean (SD)**	**Mean (SD)**	**Relative Change[a]**	***P***
Outcome score[b]							
Awareness score	5.43 (3.11)	21.40 (11.37)	2.94	6.94 (4.63)	6.36 (4.48)	-0.08	<.001
Readiness score	7.90 (13.29)	51.52 (35.02)	5.52	5.09 (10.57)	7.95 (13.42)	0.56	<.001
Awareness components							
All-hazard awareness							
Composition of emergency supply kit (MS = 13)[c]	0.71 (1.10)	5.61 (3.22)	6.90	0.94 (1.52)	0.82 (1.31)	-0.12	<.001
Composition of emergency personal information card (MS = 8)	0.28 (0.89)	3.88 (2.32)	12.86	0.50 (1.36)	0.31 (0.95)	-0.38	<.001
Household risk mapping (MS = 6)	0.05 (0.31)	2.05 (1.63)	40.00	0.12 (0.51)	0.11 (0.46)	-0.08	<.001
Planning for vulnerable groups (MS = 7)	1.46 (1.23)	3.30 (1.49)	1.26	1.56 (1.24)	1.51 (1.25)	-0.03	<.001
Household evacuation plan (MS = 5)	0.32 (0.57)	2.27 (1.44)	6.09	0.40 (0.72)	0.37 (0.72)	0.08	<.001
Earthquake(EQ) awareness							
Safe spots inside home during earthquake (MS = 5)	1.02 (0.81)	3.00 (1.29)	1.95	1.20 (0.99)	1.20 (0.96)	0	<.001
Earthquake safety maneuvers (inside) (MS = 7)	0.84 (0.81)	3.35 (1.75)	2.98	1.15 (1.01)	1.05 (0.97)	-0.08	<.001
Earthquake safety maneuvers (outside) (MS = 4)	0.85 (0.80)	2.51 (1.09)	1.95	1.12 (0.95)	0.97 (0.89)	-0.20	<.001
Postearthquake safety measures (MS = 7)	0.54 (0.77)	3.91 (2.92)	6.24	0.74 (1.44)	0.65 (1.09)	-0.12	<.001
Flood awareness							
Preflood preparedness measures (MS = 5)	0.98 (0.22)	1.80 (1.14)	0.84	1.00 (0.34)	1.03 (0.29)	0.03	<.001
Flood safety measures (MS = 5)	0.32 (0.48)	1.34 (0.87)	3.19	0.50 (0.63)	0.38 (0.54)	-0.24	<.001
Postflood safety measures (MS = 10)	0.16 (0.48)	2.68 (2.39)	15.75	0.29 (0.78)	0.23 (0.73)	-0.20	<.001
Readiness components	n (%)	n (%)		n (%)	n (%)		
Held preparedness meeting (at least 1 during past 3 mo)	392 (26.2)	1119 (74.8)	1.86	253 (16.9)	239 (16.2)	-0.04	<.001
Created a risk map of home[d]	27 (1.9)	754 (50.4)	25.52	25 (1.7)	16 (1.1)	-0.32	<.001
Created an emergency supplies kit	46 (3.1)	779 (52.5)	15.93	54 (3.6)	36 (2.4)	-0.33	<.001
Emergency personal information card	32 (2.2)	608 (41.1)	17.68	139 (9.3)	64 (4.4)	-0.52	<.001
Developed vulnerable groups' plan	53 (3.9)	433 (31.3)	7.03	56 (4.3)	38 (2.9)	-0.32	<.001
Developed emergency communication plan	119 (8.0)	668 (45.1)	4.62	97 (6.6)	49 (3.4)	-0.48	<.001
Performed at least 1 disaster drill during past 3 mo[d]	137 (9.1)	966 (65.5)	6.19	171 (11.4)	112 (7.5)	-0.34	<.001

[a] Calculation using the following formula: (Postassessment score – Preassessment score)/Preassessment score.

[b] Normalized score on scale to 100.

[c] MS: Maximum score that could be obtained.

[d] Households' actions related to either earthquake or flood were included, based on respondents' perception of the most important hazard threatening their household.

TABLE 3

Characteristics of Households and Respondents in Pre- and Postassessment Surveys

Characteristics	Intervention		Control	
	Preassessment n (%)	Postassessment n (%)	Preassessment n (%)	Postassessment n (%)
Household size & economic status				
Household size (Mean ± SD)	4.1 (1.6)	4.1 (1.4)	4.3 (1.7)	4.1 (1.6)
Dependence on social welfare aids	82 (5.5)	88 (5.9)	107 (7.2)	85 (5.7)
Monthly income (1000 RIs[a])				
<1000	332 (22.3)	220 (14.9)	371 (24.9)	325 (21.9)
1000-2500	568 (38.1)	559 (37.9)	562 (37.7)	517 (34.8)
2500-5000	498 (33.4)	577 (39.1)	495 (33.2)	558 (37.6)
>5000	94 (6.3)	120 (8.1)	64 (4.3)	85 (5.7)
Household's experience of natural hazards & related damage				
Hazard experience	933 (63.2)	1157 (77.1)	888 (59.2)	927 (62.2)
Last time experience (Mean ± SD)[b]	7.8 (7.4)	6.9 (6.9)	7.2 (7.3)	7.4 (7.6)
Life loss or injury	79 (5.2)	106 (6.9)	72 (4.9)	83 (5.3)
Economic loss	128 (8.5)	114 (7.5)	154 (10.3)	143 (9.4)
Head of household's characteristics				
Gender (Male)	1342 (89.9)	1384 (92.7)	1355 (90.4)	1342 (89.9)
Age (Mean ± SD)	46.3 (14.1)	45.4 (13.6)	46.6 (14.1)	45.8 (13.9)
Education				
Illiterate	357 (23.9)	292 (19.6)	349 (23.3)	339 (22.8)
Elementary	403 (26.9)	437 (29.3)	474 (31.6)	438 (29.4)
Middle	215 (14.4)	178 (12.0)	216 (14.4)	256 (17.2)
High school	425 (28.4)	493 (33.1)	372 (24.8)	395 (26.5)
University	96 (6.4)	89 (6.0)	87 (5.8)	61 (4.1)
Respondent's characteristics				
Gender (Female)	1189 (79.4)	1320 (88.5)	1170 (78.2)	1122 (75.1)
Age (Mean ± SD)	36.1 (13.5)	38.8 (14.9)	37.4 (14.7)	38.3 (14.9)
Education				
Illiterate	301 (20.1)	229 (15.3)	331 (22.1)	289 (19.4)
Elementary	359 (24.0)	337 (22.5)	393 (26.2)	394 (26.4)
Middle	180 (12.0)	164 (11.0)	193 (12.9)	238 (16.0)
High school	557 (37.2)	665 (44.5)	499 (33.3)	497 (33.3)
University	99 (6.6)	100 (6.7)	84 (5.6)	73 (4.9)
Position in household				
Father	288 (15.2)	110 (7.4)	233 (15.5)	262 (17.5)
Mother	1006 (67.1)	1100 (73.5)	977 (65.1)	934 (62.4)
Grandparent	10 (0.7)	5 (0.3)	12 (0.8)	7 (0.5)
Child	288 (15.2)	269 (18.0)	263 (17.5)	274 (18.3)
Single family	27 (1.8)	12 (0.8)	16 (1.1)	20 (1.3)
Risk perception (Mean ± SD)	7.0 (1.4)	6.8 (1.4)	7.0 (1.4)	6.9 (1.5)

[a] Iranian Rial.
[b] Years since the respondent experienced a natural disaster.

Ethical Considerations

The National Institute of Health Research of the Islamic Republic of Iran approved ethical considerations of the project. Also, our project did not interfere with any routine disaster preparedness programs during the entire study period in intervention or control areas.

RESULTS

The intervention and control study areas in the 3 provinces of Kerman, Golestan, and Tehran included 9200 households and 10 010 households, respectively. Our intervention program covered 93.1% of urban households and 87.2% of rural households in the intervention area.

Background Characteristics

Table 3 presents the background characteristics of respondents in the intervention and control groups. Both intervention and control areas had similar household sizes except for a small difference in control households in the preassessment survey, which showed them to be 0.2 larger than the others. Average monthly income was slightly higher in the postintervention sample of intervention households and lower in the baseline sample of control households. Control households in the

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baseline survey also showed more dependence on social welfare financial aid.

No meaningful difference was observed between study groups or study times regarding heads of household, gender, age, or education of survey respondents. The only exception noted was a higher proportion of female respondents in the postintervention survey in the intervention areas.

Intervention households reported more experience with the occurrence of natural hazards during the past 10 years (70.2% vs 60.7%). Slightly higher loss of life or injury was found in intervention households than in the controls (6.05% vs 5.1%), while respondents in the control group reported greater economic loss (8.0% vs 9.9%). No meaningful difference was found in risk perception between study groups or assessment times.

Outcome Measures

All measures of household awareness and readiness increased significantly in the intervention area compared to the control area over the 6-month study period. Relative changes of awareness were 2.94 and -0.08 in the intervention and control areas, respectively ($P < .001$). Relative changes of readiness were 5.52 and 0.56 in the intervention and control areas, respectively ($P < .001$) (Figure 2). The outcome measures are shown in Table 2.

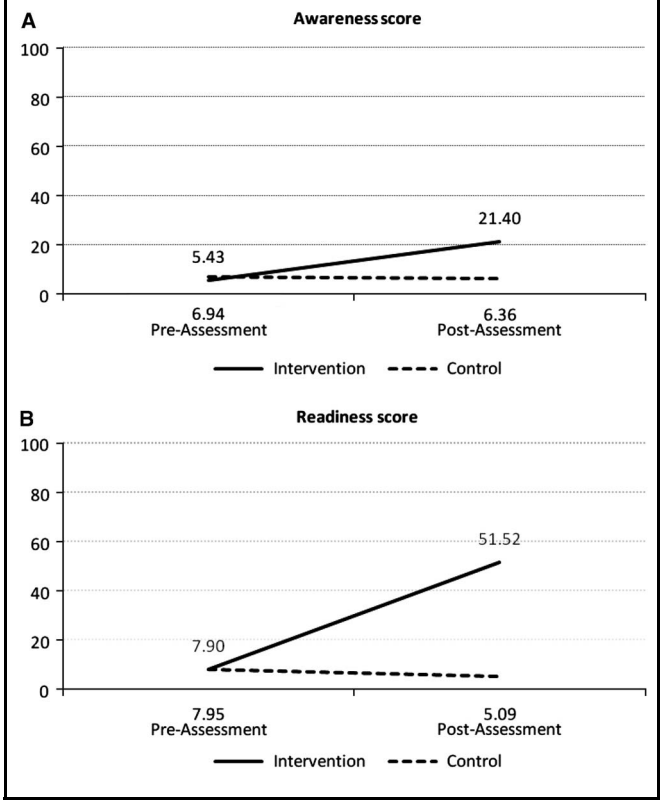
Relative changes of awareness in intervention areas of Golestan, Kerman, and Tehran provinces were 3.42, 2.18, and 3.54, respectively. Relative changes of readiness in intervention areas of Golestan, Kerman, and Tehran provinces were 5.51, 4.81, and 6.19, respectively (Figure 3).

Community risk perception and previous experience with natural disasters correlated significantly with relative changes for awareness and readiness ($P < .001$ and $P < .001$, respectively). In addition to face-to-face or mass gathering training, 639 urban intervention households (42.7%) and 638 rural intervention households (42.5%) also received color educational posters. Intervention households that received the posters had higher relative changes of awareness (21.05 vs 5.97, $P < .001$) and readiness (53.75 vs 10.35, $P < .001$) compared to those who did not receive the posters.

Outcome measures were compared between urban and rural households of intervention areas. On average, both urban and rural households showed improvement in awareness, but rural households were more likely have undertaken readiness activities (eg, conducted a drill) as a result of the intervention. Relative changes of awareness were 2.89 for urban households and 2.99 for rural households ($P = .15$). Relative changes of readiness were 4.05 for urban households and 8.13 for rural households ($P = .008$).

FIGURE 2

Disaster Awareness (A) and Readiness (B) Scores in Pre- and Postassessments of Intervention and Control Households.



DISCUSSION

The findings in this study demonstrated that a community educational intervention that leveraged the existing public health center infrastructure was effective in enhancing both awareness and readiness of the population in rural and urban areas in Iran. To our knowledge, this study is the first to conduct a comprehensive assessment of awareness and readiness of the Iranian community and one of the first in a low or middle income country.

While both urban and rural households showed a trend toward improved awareness and preparedness, rural households demonstrated greater increases in actual readiness activities undertaken as a result of the intervention. It is clear that more attention must be paid to changing urban household awareness into practice and to mobilize their participation in community programs.

This educational intervention focused on the 2 most frequent and deadly natural hazards in Iran: earthquake and flood. All 3 provinces studied were among those at highest risk for both types of disasters. The indicators of readiness activity measured practical steps taken toward enhancing preparedness.

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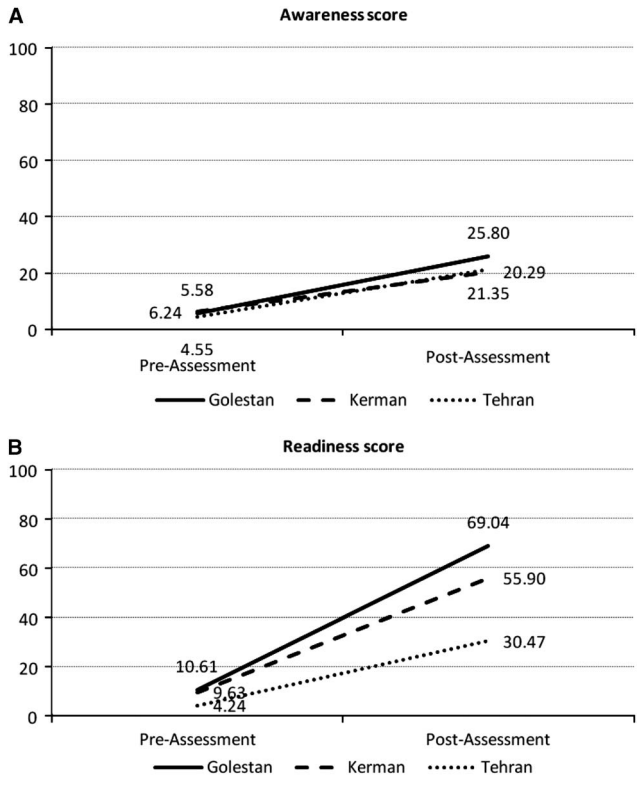
FIGURE 3

Disaster Awareness (A) and Readiness (B) Scores in Pre- and Postassessments of Intervention Households in Golestan, Kerman, and Tehran Provinces.



As this evaluation represented the first exposure of the community to this kind of intervention, we did not conduct a detailed assessment of disaster readiness; instead, a simple binary classification was used to assess whether *any* readiness activity had been undertaken. It is recommended that the next evaluation assess in greater detail the quality of readiness actions taken by the households.

The readiness process was considered to start with a household meeting and end with a drill performance. Households were expected to be able to provide an emergency kit, including an emergency personal information card for household members; draw a risk map; develop a communication plan; and a plan for vulnerable groups. During preparedness meetings, households were trained to discuss the most important natural hazards that threaten the family and share their awareness, experience, and feelings. The intervention helped households develop a plan for bringing vulnerable household members—pregnant women, children, the elderly, and people with illnesses—to safety and accounting for their medicines and necessary equipment. The household preparedness meeting was found to play an important role in the households taking other steps toward disaster preparedness.[6,7]

Participatory risk mapping also proved to be an effective visual tool for understanding disaster risk and preparedness actions,[8,9] and it was found to have a positive impact on other preparedness measures undertaken by households.[6] In the current study, the households were trained in risk mapping and were asked to draw at least 1 map for an earthquake or flood based on their own perception of which constituted the highest risk to their household. Households were encouraged to perform this activity with the contribution of all household members and to post it in a visible place such as on a refrigerator door. Along with other disaster preparedness actions, participatory risk mapping should be included in the school curricula to ensure that this activity is well understand by future generations at risk from natural hazards in Iran.

Drill performance was considered the final step of household readiness. The educational intervention trained households to conduct such drills twice annually. Drill performance should be repeated to translate awareness into practice.

In accordance with other studies,[10,11] our research showed a positive association between previous exposure to disasters and taking preparedness action. In addition, as other studies noted,[8,10,12] we found that a higher perception of risk was positively correlated with disaster preparedness. These findings call for a special focus of PHC intervention on training households with no previous exposure to natural hazards and a low level of risk perception.

The difference between background characteristics of the study areas may be a potential source of bias. While selected intervention and control study areas had similar basic characteristics, we adjusted for potential confounders by using a multiple regression analysis. The analysis estimated the measures of association between the intervention program and outcomes of interest while controlling for the potentially confounding variables.

Comparing the intervention with control communities allows for discriminating the effect of the intervention from background changes in disaster awareness and readiness that may occur as a result of other disaster-related programs outside of the study. In spite of significant increases demonstrated across the population that are attributable to the country's educational intervention and background disaster awareness efforts, the extremely low absolute level of both awareness and readiness calls for a revision of Iran's disaster preparedness policy. According to the National Disaster Management Organization (NDMO), the Iranian Red Crescent Society (IRCS) is the leading agency for community disaster preparedness and public education.[13] It is evident from our study that the IRCS is far from achieving its goal and is in need of further support, perhaps through partnership with other governmental and nongovernmental agencies.

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The well-established PHC system in Iran,[5] along with an integrated CHW network, provides an opportunity for Iranian policy makers to address community disaster preparedness. There are 150 000 CHWs throughout the country. Their role is more prominent in urban areas, where the PHC network mostly provides passive services to the community. In rural areas, health services are provided in an active manner by behvarz, the local staff of the health system who are based in about 18 000 health houses. Behvarz have a high school diploma and 2 additional years of primary health care training. In addition to myriad health monitoring and data collection activities, health education is one of their primary functions.

Disaster preparedness has been recognized as a cost effective public health strategy.[14] Communities that have awareness and have undertaken preparedness measures are more able to participate in disaster recovery, to deliver services more effectively, and to shorten the disaster response needed. The massive earthquake of Bam (2003) elevated disaster preparedness on the list of Iran's public health priorities. Consequently, more consolidated efforts have been made by the government to organize disaster response, improve health facilities, conduct regular drills, raise funds, and train policymakers, managers, and staff.[15,16]

Iran's health system has made disaster risk reduction an important public health goal. While the response capacity of Iran's health system has improved since the Bam earthquake, no program existed to target community disaster mitigation and preparedness. In 2012, the Ministry of Health and Medical Education (MOH ME) developed a program to integrate disaster risk reduction into the PHC network. The program's objective, which is the enhancement of community readiness, would be operational through a partnership between CHWs and provincial health centers in urban and rural districts. The findings of this study and that conducted previously by Ardalan et al[6] on the enhancement of community readiness for flash floods in Golestan province provided the MOH ME with evidence about the feasibility and effectiveness of such interventions based on PHC network capacity.

While no formal cost analysis was conducted as part of this study, we believe that this type of community-based educational intervention can be very cost effective. The simple educational intervention was designed to be administered by lay practitioners with minimal training. In Iran, a cadre of voluntary community health workers can provide such interventions across the country. Even in countries without such a voluntary workforce, we think that a properly designed, simple intervention could be administered through other means at minimal cost (eg, a school-based educational intervention for children and their parents) as a way of bolstering educational efforts at public health centers. The benefit of such community interventions is greatest in countries such as Iran, which has a high prevalence of natural disasters and low baseline levels of community awareness and readiness. The portion of the educational intervention that was administered directly by Ministry of Health staff at health centers was funded by additional payment for overtime when necessary. By leveraging the existing public health messaging infrastructure of public health centers, the program incurred only marginal costs rather than the full cost of a stand-alone program.

CONCLUSION

Community empowerment and participation are imperative for disaster resilience. The local community knows local hazards, vulnerabilities, and capacity the best, and, with motivation, they can mobilize existing community resources to prepare for and mitigate the effects of disasters most effectively. Community-based initiatives should be integrated into routine practice of disaster management for the purpose of maximum efficiency.

In summary, this study demonstrated an innovative public health approach to community disaster risk reduction and showed that the PHC system can be leveraged to enhance disaster readiness at a community level. Community disaster risk reduction programs must be integrated into routine health service delivery, with a focus on people who have no exposure to natural hazards and low level of risk perception, as part of a sustainable approach to community disaster mitigation.

About the Authors

Department of Disaster and Emergency Health, National Institute of Health Research (Dr Ardalan); Department of Disaster Public Health (Dr Ardalan), Department of Epidemiology and Biostatistics (Dr Malekafzali), Department of Public Health (Dr Abolhasanai), and Disaster Management Center (Dr Zonoobi), School of Public Health, Tehran University of Medical Sciences; Department of Public Health, Golestan University of Medical Sciences (Dr Zanganeh); Department of Public Health, Kerman University of Medical Sciences (Dr Safizadeh and Mr Salari); Tehran, Iran; Harvard Humanitarian Initiative, Harvard University, Cambridge, Massachusetts (Drs Ardalan and Mowafi); and Yale University, School of Medicine, New Haven, Connecticut (Dr Mowafi).

Address correspondence and reprint requests to Ali Ardalan MD, PhD, Associate Professor and Department Chair, Department of Disaster and Emergency Health, National Institute of Health Research, Department of Disaster Public Health, School of Public Health, Tehran University of Medical Sciences, No. 78, Italia Ave, Tehran, Iran (e-mail: aardalan@tums.ac.ir).

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Supplementary materials

To view supplementary material for this article, please visit *http://dx.doi.org/10.1017/dmp.2013.93*

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