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Preparedness for Protecting the Health of Community-Dwelling Vulnerable Elderly People in Eastern and Western Japan in the Event of Natural Disasters

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ABSTRACT

We clarified the preparedness necessary to protect the health of community-dwelling vulnerable elderly people following natural disasters. We collected data from 304 community general support centres throughout Japan. We found the following in particular to be challenging: availability of disaster-preparedness manuals; disaster countermeasures and management systems; creation of lists of people requiring assistance following a disaster; evacuation support systems; development of plans for health management following disasters; provision of disaster-preparedness guidance and training; disaster-preparedness systems in the community; disaster information management; the preparedness of older people themselves in requiring support; and support from other community residents.

Background

When major natural disasters strike, they present enormous challenges to the countries affected, and such disasters are occurring with increasing frequency. There is, accordingly, a greater global need to share information about disaster countermeasures. In countries with rapidly aging populations, a large number of vulnerable elderly people living at home will require assistance in the event of a disaster. Many studies have reported that the health of vulnerable elderly people is frequently worsened by disasters, and such disasters may have fatal consequences (Cherry et al., 2010, 2011; Langan & Palmer, 2012; Loke, Lai, & Fung, 2012; McCann, 2011; Nagamatsu, Maekawa, Ujike, Hashimoto, & Fuke, 2011; Nakahara & Ichikawa, 2013; Rhoads & Clayman, 2008).

In Japan, community general support centres (hereinafter, 'centres') create care prevention plans for the in-home care of elderly people in need of support. However, there is no obligation on the part of communities to produce plans for managing the health and welfare of such elderly people in the event of a disaster. Those centres are in charge of developing networks among related institutions and residents to support elderly people's daily life activities on a communitywide basis. Such networks may also be responsible for providing public and personal support for individuals requiring assistance following a disaster. The usefulness of such networks after the Great East Japan Earthquake of 2011 has been reported (Cabinet Office, Government of Japan, 2015; Iinuma, 2013; Nagamatsu et al., 2011).

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The Great East Japan Earthquake and associated tsunami affected a large number of individuals undergoing long-term care at home, their family members, and care professionals supporting them in eastern Japan (Cabinet Office, Government of Japan, 2013a, 2013b). That catastrophe underlined the necessity to investigate and promote disaster preparedness on a nationwide basis in Japan (Mitani, Kato, & Mayner, 2014). In light of Japan's experience with previous disasters, we predicted that disaster preparedness would differ in eastern and western parts of the country. However, examinations of such preparedness have involved a limited number of communities and facilities, rather than being investigated nationwide (Narita, Uda, & Kobayashi, 2013). In this regard, it is necessary to clarify the status of disaster preparedness among vulnerable elderly people. It is also important to examine such individuals in eastern, compared with western, Japan with respect to their experiences with disasters and crises, as well as to develop future perspectives for the whole country. Japan has a rapidly aging society and is subject to multiple major earthquakes; thus, clarifying the current status and challenges for supporting community-dwelling elderly people with respect to disasters in Japan may provide a basis for disaster preparedness in other rapidly aging countries (Nakahara, 2011; Parmar, Arii, & Kayden, 2013).

Purpose

This study aimed to clarify preparedness measures and support necessary to protect the health of community-dwelling vulnerable elderly people in natural disasters by analysing their status and the challenges they face. We administered a questionnaire survey involving centres throughout Japan to compare eastern and western parts of the country with regard to disaster experiences and related circumstances. We analyzed the characteristics of disaster preparedness for older people requiring support.

Methods

Settings and sample

This study employed a semistructured survey about disaster preparedness for community-dwelling vulnerable elderly people. In March 2013, we identified 4,305 centres using the local government web sites of Japan's 47 prefectures. From those 4,305 centres, we selected 1,485 (34.5%) using a stratified random sampling method. The centres are directly managed or contracted by municipalities, and they are operated by three types of professionals: care managers, social workers, and nurses. Using social resources, these centres play a key role in supporting elderly people living in their communities. We defined older people requiring support as individuals aged 65 years or above who experience difficulty in performing daily life activities because of physical or mental impairment. We requested the cooperation of the centres' representatives by post. The study was conducted between April and May 2013.

Data collection

We focused our investigation on four areas. (1) The prefectures where the centres were located; the institutions responsible for their establishment; the number of older people requiring support for whom the centres created prevention care plans; the number of older people requiring assistance during a disaster; the types of natural disasters frequently occurring in that area; and the disaster experiences of the older people supported by the centres. (2) The availability and use of disaster-preparedness manuals, methods, and details of management by staff at each centre in the event of a disaster; contact details of vulnerable elderly people to confirm their safety; the disaster risks of their households; and their access to evacuation sites. (3) Preparation of lists of people requiring assistance in the event of a disaster; collection methods for related information; availability of evacuation support, day and night; disaster support systems; creation of personalized plans for health management following a disaster; provision of disaster-preparedness

guidance and training; challenges related to disaster-preparedness systems in the community; problems related to liaison systems among medical professionals, welfare evacuation sites, and care facilities; and challenges related to methods of disaster information management. (Welfare evacuation sites are centres for people who have difficulty in using general evacuation centres.) (4) The disaster preparedness of older people requiring support; their anxiety about evacuation; and other community residents' attitudes towards supporting people in need of evacuation assistance following a disaster.

Data analysis

We compared disaster preparedness between eastern and western Japan. Those two regions are commonly recognized as being divided by the Fossa Magna, which is bounded by the Itoigawa-Shizuoka Tectonic Line. Eastern Japan consists of 18 prefectures; western Japan consists of 29 prefectures. We conducted Pearson's χ^2 test using SPSS version 21 (SPSS Inc.; Chicago, IL). We set the significance level at 5%.

Ethical consideration

The study was performed with the approval of the Committee of Medical Ethics of Kanazawa University (1 February 2013; no. 429).

Results

Sample

Among the 1,485 centres in 47 prefectures to which we sent a letter of request for cooperation, 304 centres in 44 prefectures responded (response rate, 20.5%). In eastern Japan, 178 centres in 17 prefectures (58.6%) responded. In western Japan, 126 centres in 27 prefectures (41.4%) responded.

Centre characteristics and disaster experiences

Among the 304 centres that responded, 273 provided details about the number of elderly users requiring support. The total number of such users was 48,414: 26,214 (54.1%) in eastern Japan and 22,200 (45.9%) in western Japan. Among those 273 centres, 211 indicated the number of people in the community requiring assistance following a disaster. The total number of such people was 16,119 (33.3%): 7,687 (47.7%) in eastern Japan and 8,432 (52.3%) in western Japan.

Of the 304 centres that responded, 90 (29.6%) were directly managed; 214 (70.4%) were contracted by municipalities. There was no significant difference between eastern and western Japan in the proportion of those directly managed and those contracted (χ^2 test, $p = 0.859$).

We observed significant differences between eastern and western Japan in the frequency of natural disasters. Earthquakes and heavy snowfall occurred more frequently in eastern than in western Japan ($p = 0.002$, $p = 0.01$, respectively). Typhoons and flood damage occurred more frequently in western than in eastern Japan ($p = 0.042$, $p < 0.001$, respectively; Table 1). The number of centres having been directly affected by natural disasters and the experience of supporting other affected centres was significantly higher in eastern than in western Japan ($p = 0.004$, $p = 0.015$, respectively; Table 1).

Disaster-preparedness measures of centres

Original disaster-preparedness manuals were available in 165 (61.3%) centres throughout Japan, with no significant difference between eastern and western Japan (Table 1). Among the centres in which manuals were available, 34 (20.6%) had actually used the manuals during a disaster and 16 (47.1%) stated that they had found them useful.

Table 1. Comparison of Frequencies of Natural Disasters in Local Areas, Disaster Experience, and Preparedness Measures Between Eastern and Western Japan.

	Total *n*	Eastern Japan *n* (%)†	Western Japan *n* (%)†	Difference in Rate Between Eastern and Western Japan χ^2 test; *p* value
Types of frequently occurring natural disaster:				
Earthquake	304	157 (88.2)	94 (74.6)	0.002**
Typhoon	304	104 (58.4)	88 (69.8)	0.042*
Flood damage	304	70 (39.3)	86 (68.3)	0.000***
Landslide	304	46 (25.8)	36 (28.6)	0.597
Tsunami	304	34 (19.1)	29 (23.0)	0.407
Heavy snowfall	304	42 (23.6)	15 (11.9)	0.010*
Disaster experience:				
Some users affected by disaster	294	33 (19.4)	19 (15.3)	0.364
Centre affected by disaster	300	20 (11.4)	3 (2.4)	0.004**
Centre supported others affected by disaster	293	62 (36.3)	28 (23.0)	0.015*
Original disaster preparedness manuals available	269	100 (65.8)	65 (55.6)	0.088
All users' contact details available for confirming safety	288	98 (58.0)	66 (55.5)	0.670
Details of disaster management by staff following a disaster:				
Details established within centre	304	126 (70.8)	75 (59.5)	0.041*
Details during visits available	304	31 (17.4)	13 (10.3)	0.083
Management following a disaster:				
Staff assembly criteria and work shifts established	304	99 (55.6)	46 (36.5)	0.001**
Staff evacuation criteria established	304	28 (15.7)	16 (12.7)	0.459
Disaster record sheets available	304	14 (7.9)	12 (9.5)	0.610
Criteria for discontinuing and resuming normal operations determined	304	14 (7.9)	9 (7.1)	0.815
Methods indicated for obtaining support from other facilities	304	11 (6.2)	9 (7.1)	0.739

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. †The numbers and rates of centres that responded "yes".

Following a disaster, 124 (43.1%) centres had experienced difficulty in confirming the safety of some users. We were able to determine the methods and procedures adopted by the staff following a disaster in 201 (66.1%) centres throughout Japan. The number of such centres was significantly higher in eastern than in western Japan ($p = 0.041$; Table 1). Centre staff frequently visited users following a disaster, although the details of the disaster management during the visits could be determined in only 44 (14.5%) centres.

The details of disaster management by staff following a disaster, such as staff assembly criteria and work shifts, could be determined in 145 (47.7%) centres throughout Japan. The number of such centres was significantly higher in eastern than in western Japan ($p = 0.001$; Table 1). The details related to staff evacuation criteria, disaster record sheets, criteria for discontinuing and resuming normal operations, and methods of obtaining support from other facilities were determined in approximately 10% of the centres.

Disaster risks in the homes of older users requiring support and nearby areas could not be determined for 119 centres (39.5%) throughout Japan. Furthermore, we were unable to establish the evacuation sites for users in 96 (31.9%) centres. The number of centres with determined evacuation sites for users was higher in eastern than in western Japan ($p = 0.012$; Table 2).

Preparedness for people requiring assistance following a disaster

The number of centres that lacked lists of individuals requiring assistance following a disaster was 125 (42.7%). In the case of 141 centres, some of the information regarding such people was incomplete (46.7%; Table 3a).

Supporters for all users in the event of daytime evacuation were designated for only 21 centres (7.1%). We observed similar rates for evacuation support at night. Systems to support people in the community requiring assistance following a disaster had not been fully established in 173 centres (57.1%; Table 3a).

Table 2. Comparison of Disaster Management Between Eastern and Western Japan During Visits by Centre Staff.

	Eastern Japan $n = 176$ n (%)	Western Japan $n = 125$ n (%)	Difference in Rate Between Eastern and Western Japan χ^2 test; p value
Determination of disaster risk in areas around users' home:			0.274
Generally determined	18 (10.2)	9 (7.2)	
Partially determined	84 (47.7)	71 (56.8)	
Rarely determined	74 (42.0)	45 (36.0)	
Determination of evacuation sites for users:			0.012*
Generally determined	44 (25.0)	16 (12.8)	
Partially determined	74 (42.0)	71 (56.8)	
Rarely determined	58 (33.0)	38 (30.4)	

*$p < 0.05$.

Table 3a. Disaster Preparedness for Older People Requiring Assistance During a Disaster.

	n (%)
Availability of lists of people requiring assistance following a disaster:	293 (100.0)
Both printed and digital versions available	99 (33.8)
Printed versions available	45 (15.4)
Digital versions available	24 (8.2)
Such lists not available	125 (42.7)
Collection of information about people requiring assistance following a disaster:	302 (100.0)
Sufficiently collected	23 (7.6)
Partially collected	141 (46.7)
Rarely collected	118 (39.1)
Unclear	20 (6.6)
Availability of daytime evacuation support:	294 (100.0)
Available for all users	21 (7.1)
Available for some users	59 (20.1)
Available for few users	124 (42.2)
Unclear	90 (30.6)
Availability of nighttime evacuation support:	294 (100.0)
Available for all users	18 (6.1)
Available for some users	56 (19.0)
Available for few users	125 (42.5)
Unclear	95 (32.3)
Establishment of disaster support systems:	303 (100.0)
Mostly established	13 (4.3)
Partially established	98 (32.3)
Rarely established	173 (57.1)
Unclear	19 (6.3)

Personalized plans for health management following a disaster had been established in 29 centres (10.0%). Disaster-preparedness guidance and training for families were provided in 67 (22.9%) and 33 (11.1%) centres, respectively. Among the 263 centres that did not provide such guidance and training, 89.4% responded that they were necessary but difficult to provide (Table 3b).

With respect to disaster-preparedness systems in the community, 270 (95.4%) centres were concerned about them; however, only 122 (43.1%) had such systems in place (Table 3b). Regarding future perspectives on disaster preparedness in the community, 225 (74.0%) centres considered it necessary to ensure that power sources were available if lifelines could not be maintained. Almost half of the centres indicated the necessity of ensuring means of transport for supporters, establishing criteria to implement emergency procedures and management systems, and liaising among family doctors, nurses, welfare evacuation sites, and care facilities (Table 3b).

With regard to the challenges for disaster information management, over half of the centres indicated insufficient community consensus on personal information management and systems to convey, share, and use information (Table 3b). There was no significant difference in the rate of this insufficient community consensus between eastern and western Japan.

Table 3b. Disaster Preparedness for Older People Requiring Assistance During a Disaster.

	Total *n*	Yes *n* (%)†
Personalized plans for health management in disasters available	291	29 (10.0)
Disaster-preparedness guidance for families available	292	67 (22.9)
Disaster-preparedness training for families available	296	33 (11.1)
Those who answered "necessary, but difficult" (among the 263 centres)		*235 (89.4)*
Concerns over disaster-preparedness systems in the community	283	270 (95.4)
Need for disaster-preparedness systems in the community accurately recognized	283	122 (43.1)
Challenges related to disaster preparedness:		
Difficulty in ensuring power sources when lifelines unavailable	304	225 (74.0)
Difficulty in ensuring means of transport for supporters	304	189 (62.2)
Insufficient criteria for implementation of emergency procedures and related information management	304	187 (61.5)
Liaison-related challenges:		
Insufficient liaison with family doctors/nurses	304	170 (55.9)
Insufficient liaison with welfare evacuation sites	304	152 (50.0)
Insufficient liaison between care facilities	304	144 (47.4)
Disaster information-related challenges:		
Insufficient community consensus on personal information management	304	177 (58.2)
Insufficient systems to convey information	304	174 (57.2)
Insufficient systems to share information	304	170 (55.9)
Insufficient systems to use information	304	155 (51.0)

†Numbers and rates of the centres that responded "yes".

Disaster preparedness for older people and community support

The disaster preparedness of elderly users requiring support was insufficient among 150 (51.9%) centres. Furthermore, 184 (61.5%) centres recognized that the majority of users were anxious about disaster evacuation (Table 4).

The attitudes of other community residents towards supporting people requiring assistance following a disaster and helping them evacuate appropriately were positive in 143 (48.3%) centres (Table 4). There was no significant difference between eastern and western Japan in such attitudes among community residents.

Discussion

Characteristic of the centres' disaster preparedness measures in eastern and western Japan

The aim of this study was to clarify preparedness measures and support necessary to protect the health of community-dwelling vulnerable elderly people throughout Japan after the Great East Japan Earthquake for the first time. The results of this study showed that earthquakes and heavy snowfall were actually more frequent in eastern Japan, whereas typhoons and flood damage were more

Table 4. Disaster Preparedness of Older People Requiring Support and Evacuation Support From Other Community Residents.

	n (%)
Disaster preparedness:	289 (100.0)
Majority of users sufficiently prepared	139 (48.1)
Majority of users insufficiently prepared	150 (51.9)
Anxiety over disaster evacuation:	299 (100.0)
Majority of users not anxious	16 (5.4)
Almost half of users anxious	65 (21.7)
Majority of users anxious	184 (61.5)
Unclear	34 (11.4)
Other community residents' attitudes toward helping people requiring assistance evacuate following a disaster:	296 (100.0)
Positive	143 (48.3)
Not positive	67 (22.6)
Unclear	86 (29.1)

common in western Japan. Furthermore, the number of centres with experience of having been affected by a disaster and supporting other affected centres was higher in eastern than in western Japan. Tahara, Kitagawa, Takayama, and Nagaie (2012) conducted a survey immediately before the Great East Japan Earthquake and reported that among 1,339 centres throughout Japan, 2.4% had disaster experience. In our study, we observed a higher rate (7.7%) than that of Tahara et al. This is presumably a consequence of the Great East Japan Earthquake.

Our study found that original disaster-preparedness manuals were lacking in almost 40% of the centres that responded. Almost half of the centres had actually employed those manuals during a disaster and found them to be useful; developing such materials would therefore appear to be important. The contact details of some users for confirmation of safety following a disaster were lacking among almost 40% of the centres. This highlights the necessity for devising solutions on a community-wide basis in cooperation with administrative institutions, related facilities, and residents.

The details of disaster management were established in 70% of the centres in eastern Japan, which may reflect the influence of the Great East Japan Earthquake. However, despite the frequent visits of staff members to many users, the details of disaster management during those visits were evident in fewer than 20% of centres—even in eastern Japan. Furthermore, disaster risks in the houses of older users requiring support and their nearby areas could not be determined among 40% of the centres. Evacuation sites for users were for the most part sufficiently established in over 20% of the centres in eastern Japan; this rate was higher than in western Japan. However, 30% of the centres rarely confirmed such sites. This is an important issue for centre staff because they need to protect their own safety if a disaster occurs in an unfamiliar area during work.

As part of disaster management, staff assembly criteria and work shifts were established in over half of the centres in eastern Japan. However, the details of staff evacuation criteria, disaster record sheets, criteria for discontinuing and resuming normal operations, and methods for obtaining support from other facilities were available for only 10% of the centres. This points to the need to review such areas.

Status and challenges of disaster support for people requiring assistance during a disaster in the community

Our study found that a list of people requiring assistance following a disaster was lacking in 40% of the centres. McGuire, Ford, and Okoro (2007) suggested monitoring the evacuation of community-dwelling vulnerable elderly people using the Behavioural Risk Factor Surveillance System. Promoting disaster support for individuals requiring assistance following a disaster would appear to require the urgent establishment—both in Japan and overseas—of systems to confirm the location and status of such people.

In this study, 40% of centres responded that disaster supporters had not been designated; more than half of them considered that disaster support systems in the community had been insufficiently established. People who provide support following a disaster are frequently family members and relatives, neighbours, and other community residents (Kim & Kang, 2010); this issue, therefore, needs to be addressed on a community-wide basis.

In all, 10% of the centres were planning specific disaster-preparedness measures in their prevention care plans for older people requiring support. When formulating such plans with users and their families, it may be appropriate to specify suitable methods for evacuation, storing medications, and managing health after evacuation as an effective safety measure (Tanner, 2003; Wyte-Lake, Claver, Griffin, & Dobalian, 2014), as well as promoting the users' own disaster preparedness. More than 20% of the centres provided disaster-preparedness guidance for people requiring assistance following a disaster. Additionally, 10% of the centres provided related training; though the remaining 90% did not, they realized the necessity of such training. In addition to the usual care services, national support may be required to develop disaster-preparedness plans and provide related training. This may apply to other countries as well as Japan (Daugherty, Eiring, Blake, & Howard, 2012).

Over 90% of the centres were concerned about disaster-preparedness systems in the community, and more than half did not have such systems in place. Every community in Japan needs to ensure the

availability of power sources, means of transport, appropriate emergency management procedures, and liaison among related institutions following a disaster.

Status and challenges of information management in disasters

In this study, fewer than 10% of the centres believed that information regarding people requiring assistance following a disaster had been sufficiently collected. Improving methods to convey, share, and use such information was regarded as a challenge by the majority of centres. Ever since the Act on the Protection of Personal Information was promulgated in 2003 in Japan, even administrative institutions responsible for disaster-preparedness measures in the community have faced difficulties in appropriately managing information (Cabinet Office, Government of Japan, 2015). Based on experience from the Great East Japan Earthquake, in which personal information necessary for support was unavailable or inappropriately used, the Disaster Countermeasures Basic Act of 2005 was partially revised in 2013; the revision allowed for the compilation of lists of people requiring assistance following a disaster, and for the lists to be distributed to community fire stations, welfare officers, and support groups without the need for the agreement of the individuals concerned. Information management involving cooperation between public and private institutions has been reported in other countries (Troy, Carson, Vanderbeek, & Hutton, 2008); thus, it is expected that such systems may be widely developed in Japan. In our study, over half of the centres believed there was insufficient community consensus regarding personal information management. To collect, protect, and use information appropriately, it may also be necessary to enhance awareness and establish relationships of trust in the community.

Disaster preparedness of elderly people requiring support and support from other community residents

Our study found that half of the centres regarded the disaster preparedness for older people requiring support to be insufficient. According to one report of 1,137 elderly people living in Hong Kong, only 20% were sufficiently prepared for disasters (Loke et al., 2012). One of the reasons why our study's result was higher is that we investigated disaster preparation of the vulnerable elderly people who visited the centres. However promoting older people's own disaster preparedness is a common issue in Japan and overseas.

In this study, 60% of the centres stated that the majority of elderly people were anxious about evacuation following a disaster. By focusing on such anxiety to promote behavioural changes in disaster preparedness, such individuals could be motivated to evacuate appropriately.

Half of the centres recognized the importance of positive attitudes among community residents and organizations in providing evacuation support to people requiring assistance following a disaster. The development of disaster-preparedness measures involving cooperation between related institutions and residents is reportedly effective in promoting disaster preparedness on a community-wide basis (Allen, 2006; Chen, Liu, & Chan, 2006; Pandey & Okazaki, 2005). Therefore, creating disaster evacuation-support plans on a communitywide basis for people requiring assistance following a disaster may lead to positive attitudes throughout the community towards disaster preparedness.

Implication

The centres are likely to play an important role in supporting community-dwelling vulnerable elderly people in the event of disasters.

Study limitation

The response rate in this study was only 20.5%. We received no responses from the centres in three prefectures.

Conclusion

This study found that the investigated centres recognized the status of health management following disasters for community-dwelling vulnerable elderly people from multiple viewpoints. We also identified local problems related to the centres' disaster preparedness and their shortfalls in that regard. Future studies should investigate the measures that such centres should undertake following a disaster.

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