

# Association of Interest in Disasters with an Understanding of Disaster Preparedness in Pregnant Women and Women with Infants

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### Abstract

**Background and Aim** Pregnant women need to prepare for a disaster and have knowledge of physiological changes after a disaster in order to protect not only themselves but also their fetus. The purpose of this study was to examine the awareness of the need for disaster preparedness, interest in disasters, actual preparedness for a disaster and an understanding of physiological conditions after a disaster in pregnant and postpartum women and infants and to clarify the associations among awareness, interest, understanding and actual preparedness.

**Subjects and Methods** This study was conducted between August and November in 2016. The questionnaire used in this study included questions on awareness, interest, preparedness and an understanding of physiological conditions in pregnant and postpartum women and infants after a disaster as well as background characteristics. We distributed the questionnaires to 500 pregnant women and women with infants. The Ethics Committee of Tokushima University Hospital approved the study.

**Results** The response rate was 94.4% (472/500). The proportion of women who are aware of the need for preparedness for a disaster was 74.2% and the proportion of women with an interest in disasters was 71.2%, but the proportion of women who actually prepared for a disaster was only 46.3%. Having an interest in disasters was significantly associated with actual disaster preparedness and with awareness of the need for disaster preparedness. The proportion of women who understood the physiological changes that can occur after a disaster in pregnant women, postpartum women and infants was 45.2%. Actual preparedness for a disaster but not having awareness and interest in disasters was significantly associated with an understanding of physiological conditions after a disaster in pregnant women and infants.

Conclusion Pregnant women and women with infants did not have a sufficient understanding of the possible physiological changes after a disaster in pregnant women and postpartum women. Actual preparedness for a disaster as well as having an interest in disasters may be needed for an understanding of the physiological changes.

**Key words** : disaster preparedness, pregnant women, infants, mother

キーワード : 災害準備, 妊婦, 乳幼児, 母親

## Introduction

Japan has many earthquakes. Large disasters that have occurred in Japan such as the Han-Shin Awaji Earthquake in 1995, the Niigataken Chuetsu-oki Earthquake in 2007, the Great East Japan Earthquake in 2011 and the earthquake in Kumamoto in 2016 are well known. Although Tokushima Prefecture in Japan is included in the focal region of a Nankai Trough earthquake with an estimated magnitude of 9.1, it is impossible to precisely predict when such an earthquake will occur. According to the earthquake and tsunami consciousness survey of residents targeting 500 people whose ages are more than 20 years in Tokushima prefecture in 2015, 78.5% of women in the prefecture have an interest in a possible Nankai Trough earthquake. However, only 58.3% of women had knowledge of earthquake early warnings and only 54.2% of women discussed with their family about a possible disaster through watching the news. Also, only 23.4% of women actually prepared food reserves<sup>9)</sup>. These results indicate that there is much interest in disasters but that the proportion of people who have actually prepared for a disaster is small. How to instill awareness of disaster preparedness in people and link to actual disaster preparedness is an important issue.

Pregnant women often experience feelings of

vulnerability, and physiological conditions in a non-pregnant state and pregnant state are different. Pregnant women should pay attention to disasters in order to protect not only themselves but also their fetus, and they need to prepare for a disaster and have knowledge about their physiological conditions. However, there have been few studies on the preparedness for a disaster by pregnant women and child-caring mothers in Japan. It has been reported that the proportion of pregnant women in Japan who had an interest in disasters was 88.6% and that there were no significant differences in interest in disasters according to a past history of pregnancy and experience of a disaster<sup>7)</sup>. Also, Takami et al. reported that many pregnant women did not prepare an evacuation bag and decide how to make contact with other people because the preparedness takes time and needs adjustment with other persons<sup>7)</sup>. It was reported that the proportion of pregnant women and child-caring mothers in Japan who talked about measures for a disaster with their family was only 9% and that the proportion who did not talk about measures for a disaster was 58.4%<sup>5)</sup>. It was also reported that 75% of pregnant women and child-caring women did not prepare an evacuation bag<sup>5)</sup>.

We hypothesized that pregnant women with high levels of awareness of the need for disaster preparedness and interest in disasters may actually

prepare for a disaster and understand the changes in physiological conditions during pregnancy and postpartum after a disaster. The aim of this study was to determine the degrees of awareness of the need for disaster preparedness, interest in disasters, actual preparedness for a disaster and an understanding of physiological conditions after a disaster in pregnant women, postpartum women and infants and to clarify the associations among awareness, interest, understanding and actual preparedness.

### **Subjects and Methods**

This study was conducted between August and November in 2016. We explained the aim and methods of the study to directors of hospitals and clinics in Tokushima Prefecture in which the number of deliveries is more than 300 each year and hospitals and clinics in which the directors gave consent for participation in the study were established as cooperation organizations. The staff in the hospitals and clinics explained the contents of the study to pregnant women and women with infants who were outpatients and asked for participation in the study. Agreement for participation in this study was obtained by having the questionnaire form returned to us. We distributed questionnaires to 500 pregnant women and women with infants. The Ethics Committee of Tokushima University Hospital approved the study (No. 2675).

### **Questionnaire**

The questionnaire used in this study was based on questions in a survey on disaster countermeasure

for pregnant women and infants living in Tokyo that was conducted by the Tokyo Metropolitan Government Bureau of Social Welfare and Public Health in 2016 <sup>2)</sup>.

The first part of the questionnaire was questions on background characteristics of the women such as age, week of pregnancy or puerperium, family structure, number of children and age of child/children. The second part of the questionnaire was questions on (1) experience of disasters such as an earthquake, tsunami, flood, typhoon, strong wind, volcanic eruption, debris flow and snow storm, (2) awareness of the need for preparedness for a disaster, (3) interest in disasters with the possibility of the occurrence of an earthquake with a high magnitude, (4) awareness of safety in the area where the woman lived, (5) practice of disaster preparedness and measures, (6) an understanding that pregnant women and infants are vulnerable people, and (7) an understanding of possible changes in physiological conditions in pregnant women, postpartum women and infants change after the occurrence of a disaster as follows: 1) pregnant women are sensitive to abdominal tension, 2) pregnant women may have genital bleeding, 3) pregnant women and postpartum women are more likely than other women to have a fever and catch a cold, 4) pregnant women and postpartum women are more likely than other women to have venous thromboembolism, 5) pregnant women and postpartum women are more likely than other women to have increased blood pressure, 6) secretion of lactation in postpartum women with breastfeeding may stop, 7) postpartum women are likely to have an increase in vaginal discharge and it may continue for a long time, 8) infants may

have hypersensitive responses and may panic, 9) symptoms such as nausea, abdominal pain, headache, dizziness and breathless may occur in infants, 10) infants may be restless, act violently with irritability and oppose something, 11) infants may show no facial expression and hardly talk, 12) infants may act like babies and 13) infants may act and talk as if something unrealistic has occurred.

### Statistical analysis

We carried out analysis by using SPSS Statistics 21. We used the chi-square test to assess associations of experience of disasters with awareness of the need for disaster preparedness and interest in disasters, associations of awareness of the need for disaster preparedness with interest in disasters and preparedness for a disaster, association of interest in disasters with preparedness for a disaster, associations of awareness of disaster preparedness, interest in disasters and preparedness for a disaster with knowledge of possible changes in physiological conditions after a disaster in pregnant women, postpartum women and infants. The statistical significance was established at 0.05 level.

## Results

Four hundred and seventy-two pregnant women and women with infants returned questionnaires (response rate: 94.4%). The valid response rate was 93.8% since responses were insufficient in 3 questionnaires.

### 1. Background characteristics of the subjects

The mean age  $\pm$  standard deviation of the subjects

was  $27.4 \pm 5.8$  years. The proportion of subjects in their 30s was high (60.4%). The proportions of pregnant women in the second trimester (31.8%) and third trimester (45.2%) were high. The proportion of subjects who lived with their partner was 54.0%. The proportion of women lived with their child/children was 32.9% and the proportion of women who lived with a child/children aged 0-3 years was 64.3%.

### 2. Awareness of the need for disaster preparedness and interest in disasters

The proportion of women who had experienced a disaster was only 5.3%. The proportion of women who are aware of the need for preparedness for a disaster following the Great East Japan Earthquake and the earthquake in Kumamoto was 74.2%. With respect to interest in disasters with the possibility of the occurrence of a strong earthquake, the proportion of women with strong or moderate interest was 71.2% and the proportion of women with little interest was 28.4%. The proportion of women who responded that the area where they lived is not safe was 60.9% and the proportion of women who responded "I cannot say" was 21.7%. There were no significant associations of experience of a disaster with awareness of the need for disaster preparedness ( $p=0.657$ ) and interest in disasters ( $p=0.942$ ). Awareness of the need for disaster preparedness was significantly associated with interest in disasters ( $p=0.004$ ).

### 3. Preparedness for a disaster

The proportion of women who prepared for a disaster was 46.3%. The main reason given by women not having prepared for a disaster was

that they intended to do it sometimes in the near future (88.9%) (Table 1). There was no significant association of having awareness of the need for preparedness with actual preparedness for a disaster ( $p=0.156$ ). There was a significant association of having an interest in disasters with actual preparedness for a disaster ( $p<0.001$ ) (Table 2).

#### 4. Understanding the changes in physiological conditions of infants and lactation

The proportion of women who sufficiently understood the term vulnerable people was 33.7% and the proportion of women who did not know at all was 28.9%. The proportion of women who understood the possible changes in physiological conditions in pregnant women, postpartum women and infants after the occurrence of a disaster was

**Table 1. Awareness of the need for disaster preparedness and interest in disasters and preparedness for a disaster**

Items		Number	Proportion (%)
Having experience of a disaster	Yes	25	5.3
	No	443	94.5
	Missing	1	0.2
Having awareness of the need for preparedness for a disaster following the Great East Japan Earthquake and the earthquake in Kumamoto	Yes	348	74.2
	No	119	25.4
	Missing	2	0.4
Having interest in disasters	Strong	31	6.6
	Moderate	303	64.6
	Not really	133	28.4
	No	2	0.4
The area where the subject lives is safe	Yes	81	17.2
	No	285	60.9
	Cannot say	102	21.7
	Missing	1	0.2
Actual preparation for a disaster	Yes	217	46.3
	No	251	53.5
	Missing	1	0.2
Reasons for not preparing for a disaster	Will do it in the near future	417	88.9
	Troublesome	31	6.6
	No time	19	4.1
	No need	1	0.2
	Missing	1	0.2
Understanding of the meaning of vulnerable people	Sufficient understanding	158	33.7
	Insufficient understanding	171	36.5
	No understanding	136	28.9
	Missing	4	0.9
Understanding of changes in physiological conditions of pregnant women, puerperium women and infants after a disaster	Understanding	212	45.2
	No understanding	250	53.3
	Missing	7	1.5

**Table 2. Association of actual preparedness for a disaster with awareness of the need for disaster preparedness and interest in disasters**

		Actual preparedness for a disaster		p values
		Yes Number (%)	No Number (%)	
Awareness of the need for disaster preparedness	Yes	167 (78.8)	182 (73.0)	0.156
	No	45 (21.2)	67 (27.0)	
Interest in disasters	Yes	176 (83.0)	151 (60.6)	<0.001
	No	36 (17.0)	98 (39.4)	

45.2%. As can be seen in Table 1, women had a sufficient understanding of the following changes in physiological conditions of infants and lactation: infants may have hypersensitive responses and panic (88.4%), symptoms such as nausea, abdominal pain, headache, dizziness and breathless may occur in infants (77.0%), infants may be restless, act violently with irritability and oppose something (75.8%), and secretion of lactation in postpartum women with breastfeeding may stop (83.0%). On the other hand,

women did not have a sufficient understanding of the following changes in physiological conditions in pregnant women and postpartum women: pregnant women and postpartum women are likely to have venous thromboembolism (36.2%), pregnant women and postpartum women are likely to have increased blood pressure (35.7%) and postpartum women are likely to have increased vaginal discharge that may continue for a long time (29.6%) (Table 4).

There was a significant association of an

**Table 3. Association of understanding the changes in physiological conditions of infants and lactation with awareness of the need for disaster preparedness, interest in disasters and actual preparedness for a disaster**

	Understanding the changes in physiological conditions of infants and lactation			p values
		Yes Number (%)	No Number (%)	
Awareness of the need for disaster preparedness	Yes	159 (76.8)	182 (62.7)	0.654
	No	48 (23.2)	61 (25.0)	
Interest in disasters	Yes	19 ( 9.0)	12 ( 4.8)	0.073
	No	192 (90.1)	238 (95.2)	
Actual preparedness for a disaster	Yes	109 (51.7)	104 (41.6)	0.031
	No	102 (48.3)	146 (66.4)	

**Table 4. Understanding of physiological conditions in pregnant and postpartum women and infants after a disaster**

Items	Number	%
Infants may have hypersensitive responses and panic.	161	(88.4)
Secretion of lactation in postpartum women with breastfeeding may stop.	151	(83.0)
Symptoms such as nausea, abdominal pain, headache, dizziness, breathless may occur in infants.	140	(77.0)
Pregnant women are susceptible to abdominal tension.	139	(76.3)
Infants are restless, act violently with irritability and oppose something.	138	(75.8)
Pregnant women are susceptible to genital bleeding.	114	(62.6)
Infants may show no facial expression and hardly talk.	96	(52.7)
Infants may act like babies.	92	(50.5)
Pregnant women and postpartum women are likely to have fever and catch a cold.	88	(48.3)
Pregnant women and postpartum women are likely to have venous thromboembolism.	66	(36.2)
Infants may act and talk as if something unrealistic has occurred.	65	(35.7)
Pregnant women and postpartum women are likely to have increased blood pressure.	65	(35.7)
Postpartum women are likely to have an increase in vaginal discharge and it may continue for a long time.	54	(29.6)

understanding of vulnerable people with having knowledge regarding physiological conditions after a disaster in pregnant women and infants ( $p=0.003$ ). Awareness of the need for disaster preparedness was not significantly associated with an understanding of physiological conditions after a disaster in pregnant women and infants ( $p=0.654$ ). Having an interest in disasters was also not significantly associated with an understanding of physiological conditions after a disaster in pregnant women and infants ( $p=0.073$ ). Actual preparedness for a disaster was significantly associated with an understanding of physiological conditions after a disaster in pregnant women and infants ( $p=0.031$ ) (Table 3).

## Discussion

It has been reported that approximately 80% of women have an interest in disaster preparedness<sup>7)</sup> and that 86.4% of mothers have an interest in disasters<sup>12)</sup>. We presumed that the proportions of subjects with awareness and interest may be low since the proportion of subjects who had experienced a disaster was only 5%. However, the proportion of subjects with awareness of the need for disaster preparedness and an interest in disasters was relatively high (70%). A previous study revealed that experience of a disaster was not related to disaster preparedness<sup>7)</sup>. It has been reported that excessive reminders of disaster experience interfered with disaster preparedness<sup>15)</sup>, and this may be the reason why experience of a disaster is not linked to disaster preparedness. Also, it has been suggested that experience in the past and prediction for the future do not result in motivation of current preparedness for a disaster<sup>8)</sup>.

We showed that pregnant women had high levels of awareness and interest in disasters since they might feel fear and anxiety regarding a disaster. However, only awareness of the need for disaster preparedness was not associated with actual disaster preparedness. Pregnant women might consider a disaster as something that would not occur where they are living. Yamamoto et al. suggested that it was not easy for people to act concretely even if they have necessary knowledge and experience through education for disaster<sup>10)</sup>. Nozawa et al. reported that enhancement of awareness and action for preparedness of an undetermined disaster were difficult<sup>6)</sup>. It is necessary to enhance awareness with focus on preparedness for a disaster without highlighting fear of a disaster<sup>1)</sup>. suggested that focusing on what actions should be taken rather than on the horrors of disasters and the probabilities of disaster occurring might reduce actual future losses<sup>1)</sup>. Awareness of the possibility of a disaster occurring where they are living might lead to preparations being taken by pregnant women.

We showed that interest in disasters was associated with actual disaster preparedness and with awareness of the need for disaster preparedness. Thus, having an interest in disasters is important for actual disaster preparedness. It is important to make pregnant women and mothers of infants have an interest in disasters by displaying posters on disasters and distributing pamphlets for disaster prevention. Educational intervention by midwives and public health nurses may be needed at maternal and infants medical examinations. Recently, it has been reported that an educational program at the second trimester had a positive effect for pregnant women and resulted in both

greater awareness of the need for preparation and actual actions taken for preparation<sup>11)</sup>.

In the present study, we showed that pregnant women and women with infants had an understanding of the physiological changes that might occur in infants after a disaster but did not have a sufficient understanding of possible physiological changes such as an increase in blood pressure and occurrence of venous thromboembolism in pregnant women and postpartum women after a disaster. With regard to physiological conditions of infants, it may be easy for pregnant women to obtain information from a network in the community through child-rearing. Also, pregnant women may feel that the physiological status in infants might be threatened by a disaster. Pregnant women may obtain information on physiological conditions of a fetus and child because they have a greater interest in protecting the fetus and child than in protecting themselves<sup>13)</sup>. Pregnant women are a vulnerable population at high risk for injury, illness and death during and after disasters. An approach that will enable pregnant women to understand changes in physiological conditions after a disaster should be considered. Intervention for pregnant women by midwives may be needed.

We showed that an understanding of changes in physiological conditions in pregnant women was associated with actual disaster preparedness but not with awareness of the need for disaster preparedness or interest in disasters. Pregnant women may obtain information on changes in physiological conditions in the process of actual preparedness for a disaster. Haraoka et al. reported that behavior for disaster preparedness during a safe period was associated with study and training

for disaster prevention<sup>4)</sup>. Yasunari et al. reported that an educational program in pregnant women resulted in both heightened awareness of the need for preparation and actual action but that making pregnant women take actions for preparation is more difficult than providing them with information and making them aware of the need for preparation<sup>11)</sup>.

It is necessary to consider appropriate means for increasing the degree of actual preparedness for a disaster. Public health nurses and midwives should provide appropriate information regarding disaster preparedness for pregnant women and mothers with infants in order to reduce the risks caused a disaster. Maternity classes and classes for parents may be good opportunities to educate pregnant women about disasters. Watanabe et al. suggested that it is important for pregnant women and mothers to imagine disasters and obtain information on disasters through education by midwives and public health nurses<sup>13)</sup>. It has been suggested that written prenatal records kept by pregnant women are important in geographic areas that are prone to natural disasters<sup>3)</sup>. The results in the present study are important since it is reported that 40% of the residents in Tokushima city will spend an evacuation life if a Nankai Trough earthquake occurs in Japan.

This study has several limitations. The study was conducted in a regional area of Japan and the sample size was small. We could not show causal relationships among awareness of the need for disaster preparedness, interest in disasters and an understanding of disasters. Further study with a larger number of subjects is needed.

In conclusion, pregnant women and women with infants did not have a sufficient understanding of possible physiological changes caused by a disaster



in pregnant women and postpartum women. Actual preparedness for a disaster as well as having an interest in disasters may be needed for an understanding of physiological changes.

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