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Maternal Anxiety 16 Months after the Great East Japan Earthquake Disaster Area: First Report

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Abstract

The Great East Japan Earthquake, a magnitude 9.0 quake that occurred on March 11, 2011, left more than 20,000 killed or missing and resulted in more than 400,000 people being displaced. The Fukushima Nuclear Power Plant accident released large amounts of radioactive material into the air. Among the victims of this combined disaster were many pregnant and parturient women, and this study aimed to determine post-disaster anxiety among this specific population and measures for the future. Participants were 259 women (mean age 33.02 ± 4.79 years) who gave birth around the time of the earthquake in Miyagi Prefecture, one of the disaster areas. Sixteen months after the earthquake, we administered survey questionnaires on anxiety. We transcribed questionnaire responses, coded raw data by context, and categorized these codes by commonality. After extracting subcategories of anxiety-related factors, we categorized them into more abstract concepts. Among the participants, 126 (48.6%) reported having no available professionals with whom they could consult about childrearing. Participants reported anxiety in the following 12 categories: "radiation," "child's physical and mental growth/development," "recurrence of earthquake and tsunami," "financial issues," "childrearing environment," "living environment," "maternal employment," "stigma," "familial issues," "maternal health," "childrearing," and "the future". A beneficial way to reduce maternal anxiety in the 12 areas identified would be to develop support systems that provide continuous support for children's mental health care needs, psychological guidance, community support for maternal empowerment, outreach for individual support, and professional consultation for mothers who have high anxiety about radioactivity.

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Keywords

Earthquake, Maternal Anxiety, Child Care, Disaster Area

1. Introduction

The Great East Japan Earthquake, a magnitude 9.0 quake that occurred on March 11, 2011, was centered offshore of Sanriku in Miyagi Prefecture, northeastern Japan [1]. Miyagi, Iwate, and Fukushima prefectures were struck by the earthquake and subsequent tsunami. As of July 31, 2013, over 20,000 were missing or killed (**Figure 1**), and over 400,000 people were evacuated in the aftermath [2]. Many people in the areas flooded by the tsunami had to live in shelters for several months, while some moved inland [3]. In addition, the Fukushima Nuclear Power Plant accident caused by the tsunami released large amounts of radioactive materials into the air [4]. On March 12, 2011, the government issued an evacuation order for people living within a 20-km radius of the plant [5]. Many pregnant and parturient women lived in these areas. It is well documented that women in general are particularly susceptible to adverse effects of a disaster [6]-[10] and the March 11 tragedy reawakened our awareness of the need to manage maternal anxiety after the acute phase of a disaster.

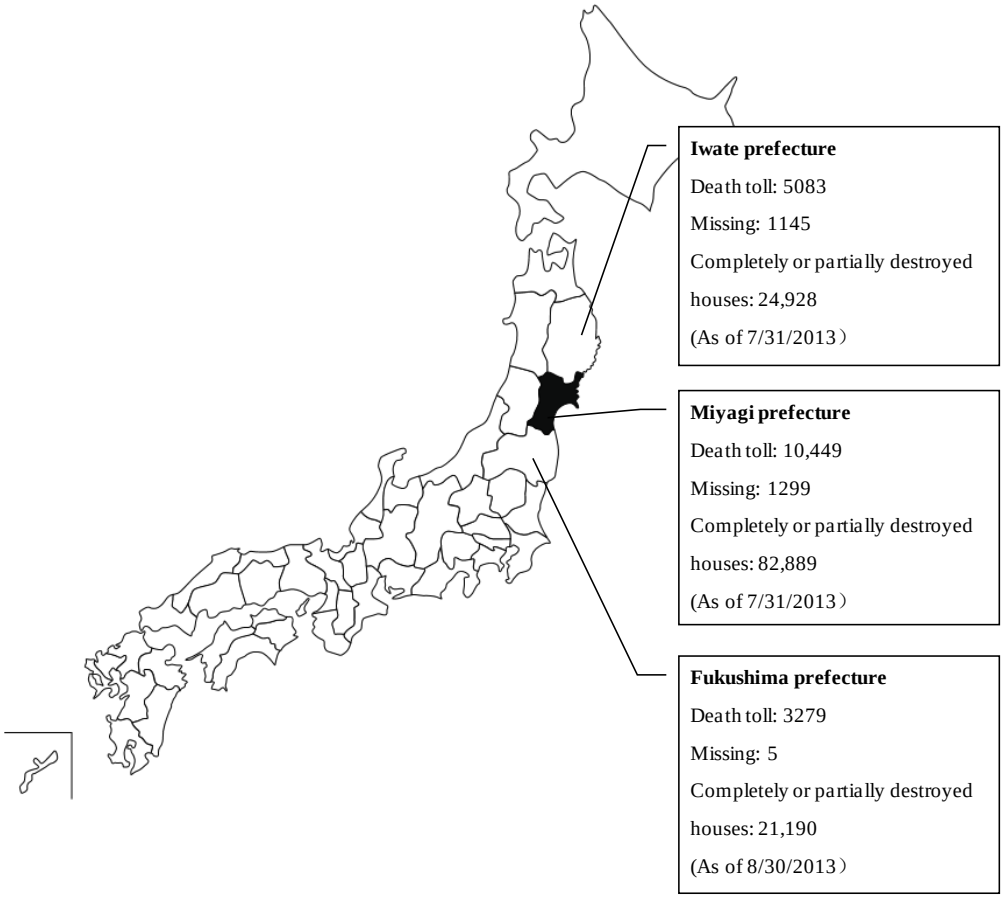

Figure 1. Disaster Areas following the Great East Japan Earthquake, with Miyagi Prefecture shown in Black from which the Participants Were Recruited. Sources: Fukushima Prefecture Earthquake Damage Information http://wwwcms.pref.fukushima.jp/pcp_portal/PortalServlet?DISPLAY_ID=DIRECT&NEXT_DISPLAY_ID=U000004&CONTENTS_ID=24914; Iwate Prefecture Disaster Prevention Portal Site http://www.pref.iwate.jp/~bousai/; Miyagi Prefecture Official Website http://www.pref.miyagi.jp/site/ej-earthquake/.

This study reports the results of a survey on post-disaster anxiety administered 16 months after the Great East Japan Earthquake to mothers in Miyagi Prefecture who had delivered a child around the time of the earthquake in order to investigate various sources of anxiety in their lives and determine the most appropriate means of support.

2. Methods

2.1. Subjects

Study participants were mothers who had delivered a child less than one month before the Great East Japan Earthquake that occurred on March 11, 2011, and pregnant women who had received a "Maternal and Child Health Handbook," the handbook issued by Japanese municipal governments in accordance with Article 16 of the Maternal and Child Health Law for pregnant women who report their pregnancy to a municipal office. We contacted 26 medical institutions in Miyagi Prefecture and asked them to explain the purpose of this study to their patients who gave birth during the period from February 2011 through September 2011. We administered the survey in July 2012.

2.2. Ethical Considerations

Approval to conduct this research was obtained from the Graduate School of Medicine, Tohoku University and hospitals and government offices in Tohoku, Japan that agreed to participate after receiving an explanation of the study. We informed the participants that the content of the investigation would be used for research only and that they could withdraw from the study at any time. We also explained that their participation would be kept confidential. Before starting the investigation, we obtained signed informed consent forms from all participants.

2.3. Questionnaire Survey

The survey questionnaire included open-ended questions asking participants to describe their anxieties. After collecting basic demographic information, the questionnaire began with the general question, "What is causing you anxiety?" to which participants could freely express their responses.

2.4. Analytical Methods

We transcribed the questionnaire responses, coded anxiety-related raw data by context, and categorized these codes by commonality. We then extracted subcategories of these anxiety-related factors and further categorized them into more abstract concepts. We used ATLAS. ti. 7.0 software (Scientific Software Development GmbH, Berlin) for data analysis. We chose this analytical method because it feeds appropriately into a concept analysis rather than a qualitative theory [11]. Data analysis was started with iterative reading to facilitate familiarity with the data, allowing for the beginnings of an interpretative process. To enhance credibility of the analytical process, the co-authors analyzed the data, verified the coding, and organized the data into themes.

3. Results

3.1. Participant Characteristics

Among 886 women who initially agreed to participate, the final sample comprised 259 women who returned their questionnaires. The mean age of participants was 33.02 ± 4.79 years. Most participants (179, 69.1%) were in their 30 s. Among all participants, 99 (38.2%) were primiparae and 160 (61.8%) were multiparae. In addition, 49 (18.9%) had to move to another residence after the earthquake, most of whom (17, 34.7%) moved to rental housing provided by the prefecture followed by 6 (12.2%) who moved to temporary housing. As for their general health condition since the earthquake to the present time, 179 (69.9%) reported they were "healthy," 61 (23.8%) reported that they "became ill, but recovered," and 16 (6.3%) reported that they were "still ill." In addition, 126 (48.6%) reported the unavailability of childrearing professionals (e.g., physicians or public health nurses) with whom they could consult (**Table 1**).

3.2. Maternal Anxiety

We classified 454 codes for maternal anxiety into 66 subcategories. We then classified these subcategories into

12 higher level categories: "radiation," "child's physical and mental growth/development," "recurrence of earthquake and tsunami," "financial issues," "childrearing environment," "living environment," "maternal employment," "stigma," "familial issues," "maternal health," "childrearing," and "the future." **Table 2** describes each category.

Table 1. Demographic characteristics of participants.

Characteristic	n	%
Current residence		
No change	210	81.1
Temporary housing	6	2.3
Rental housing	17	6.6
Own parent's house	5	1.9
Husband's parents' house	2	1
Other	19	7.1
Employment		
Yes	107	41.3
No	152	58.7
Type of employment		
Side job	2	0.8
Part time	25	9.7
Full time	57	22
Self-employed	7	2.7
On maternity leave	5	1.9
Other	11	4.2
None	152	58.7
Health condition after the earthquake		
Healthy	179	69.1
Became ill, but recovered	61	23.6
Still ill	16	6.2
No answer	3	1.2
No. of children		
1	99	38.2
2	110	42.5
3	39	15.1
4	5	1.9
5	4	1.5
6	1	0.4
No answer	1	0.4
Currently pregnant		
Yes	14	5.4
No	245	94.6
Have someone I can consult about children's issues		
Definitely yes	169	65.3
Somewhat yes	72	27.8
Somewhat no	13	5
Definitely no	4	1.5
No answer	1	0.4
Have someone I can consult about childrearing (e.g., professionals such as physician and public health nurse)		
Definitely yes	59	22.8
Somewhat yes	73	28.2
Somewhat no	71	27.4
Definitely no	55	21.2
No answer	1	0.4

Table 2. Mother's anxiety in a disaster area.

Category	Subcategory
Radiation	Food safety
	Outdoor safety
	Influence on an unborn child
	Influence on children
	Influence of radiation on the human body
Child's physical and mental growth/development	Financial damage
	Distrust of public announcements
	Mental impact of disaster experience
	Mental impact of parents' instability
	Developmental delay and issues
	Illness
	Future health condition
	Weight loss or gain
Recurrence of earthquake and tsunami, and aftershocks	Ability to protect children
	Evacuation
	Recurrence
	Anxiety during the time apart from one's own child
	Anxiety during husband's absence
Financial issues	Lifelines
	Housing loan issues caused by the earthquake
	Financial damage caused by the earthquake
	Money for the future
	Living expenses
	Reserve for child's education
	Consumption tax increase
	Low income due to a single parent household
Childrearing environment	Playground
	New neighborhood
	Daycare center
	Child's making friends
	Mother's making friends
	Shortage of pediatricians
	Future life after childbirth
Living environment	New school
	Unable to find permanent housing
	Remaining in a disaster area
	Life in temporary housing
	Reconstruction
	Crimes
Maternal employment	Returning to work
	Daycare for children while working
	Balance between work and childrearing
	Child's becoming ill
	Job search
	Responsibilities at the workplace
	Sense of guilt over sending child to daycare center
	Sense of guilt about maternity leave

Continued

Stigma	Being stigmatized as a disaster victim
	Being stigmatized by other disaster victims
Familial issues	Health condition of parents and relatives
	Relationship with parents and relatives
	Husband's employment and health condition
	Relationship with husband
Maternal health	Fatigue
	Poor conditions
	Mental issues
	No physical energy
	Currently pregnant
	No available professionals to consult
Childrearing	Discipline
	How to communicate with children
	Weaning
	Meals
	Sleep
Future	Future life
	Future of Japan

4. Discussion

The total number of fatalities in Miyagi prefecture was 10,449 (**Figure 1**). Strong aftershocks struck the area daily for at least the first month [12]. One month after the earthquake, there was a strong aftershock with seismic intensity in the high sixes in Miyagi Prefecture, then in December 2012, another tsunami warning was issued and a 1-meter high tsunami was observed in Ishinomaki City. Aftershocks still occur intermittently, and they have kept people in these areas alert and anxious even 2 years later. Given this situation, study participants reported strong anxiety about the recurrence of earthquakes and tsunamis along with aftershocks. Specifically, they were concerned about "whether they are able to protect their children," and "whether they are able to guide their children safely to evacuation areas." Japanese government agencies and the mass media still provide information about evacuation routes and survival kits for disasters. In the prefecture, 82,889 houses were completely destroyed (**Figure 1**). Approximately 2853 victims were evacuated to shelters within the prefecture and 8524 were evacuated outside it. Even 16 months later, many respondents were still living in temporary housing with no plans for a permanent residence or living within the disaster area, which led them report "anxiety about their living environment." Accordingly, their "childrearing environment" also changed, which led to related anxieties including adjustment to new locations and facilities, as well as the continued contamination of many playgrounds and a resulting shortage of safe play areas for children. Respondents also reported anxiety related to "family issues" and "stigma" because many of their family members (parents, siblings, and other relatives) were also victims. Among those who reported anxiety about "financial issues," some worried about housing loan issues due to the earthquake. Although their anxiety about "childrearing," "maternal employment," and "the future" might be common to all mothers, the physical and mental health condition of these victims is far more serious than those living under normal conditions, as evident from the following: 1) more than 30% of respondents had physical problems after the earthquake; 2) they often reported "anxiety about their own health"; 3) many respondents scored below the median for "physical condition" (46.9%) and "anxiety and sleeplessness" (92.4%); and 4) results on the General Health Questionnaire 28 administered by one of the authors (K.S.) to the same sample [13] revealed that scores (>0.6) of more than 66.4% of these respondents denoted a high risk of developing mental health problems. Disasters occur unexpectedly and suddenly, thereby forcing people to face the fear of death, or actual death, which often induces posttraumatic stress reaction in survivors, some of whom are subsequently diagnosed with posttraumatic stress disorder (PTSD) [14]. In many cases of PTSD, a wide range of

difficulties often coincide, such as anxiety disorders, mood disorders, and drug and alcohol abuse. In addition to traumatic stress, disasters often induce other types of stress, including sense of loss and guilt. Therefore, a thorough investigation of disaster victims' mental condition, including PTSD, is needed, and it is equally necessary to provide them every possible means of support [15].

Respondents also expressed anxiety about their "child's physical and mental growth/development". Catastrophic disasters such as earthquakes and war cause tremendous physical and mental damage [16]. McLaughlin and colleagues interviewed 797 children (aged 4 - 17 years) 27 months after a hurricane and found 15% were experiencing serious emotional disturbances, including aggression, self-injury, excessive fear, anxiety, withdrawal, learning difficulties, and PTSD. After 36 - 39 months, 11% continued to experience these problems [17]. PTSD is an anxiety disorder that occurs in the aftermath of a traumatic event [16]. Similarly, mothers in this study also felt insecure, and the following codes emerged: "being incapable of managing mental health care in sensitive and fearful conditions," and "having no idea what to do with children's 'tsunami game' play." The tsunami game is a type of posttraumatic play in which traumatized children repeatedly reproduce the index event. These phenomena appeared to be improved 1 year after the earthquake. However, some children still exhibited PTSD symptoms, and others sometimes showed these symptoms long after the earthquake, causing trouble for some schools and daycare centers to handle, including truancy, reluctance to attend school, bullying based on discrimination of victims, and impulsive behaviors such as wrist cutting [18]. As part of the "Mental Health Care Team" activities sponsored by the Japanese Ministry of Health, Labour and Welfare, Umezaki and Arachi explained to mothers that these phenomena are temporary acute stress disorders that are typical for children in disaster areas, and they counseled them about how to communicate with their children by providing brochures (*i.e.*, *Handbook for Families with Children Who Experienced a Disaster* [The Japanese Society for Child and Adolescent Psychiatry], *Children Who Experienced a Disaster—Mental Health Care*, and *For Mental Health Care* [Miyagi Prefecture Mental Health Care Center]) [19]. As Jones and Schmidt reported, children of different ages and developmental stages are affected differently by disaster, therefore the impact of disasters on children does not always immediately appear [17]. In fact, they can resurface and persist over a long period of time. Consequently, long-term support systems that provide access to consult services on childrearing are necessary for the maintenance and promotion of both physical and mental health.

Another characteristic finding of this study is anxiety about radiation, which is equal to the fear of earthquakes or tsunamis. Miyagi Prefecture, where our hospital is located, is in eastern Japan, ~68 km (~42.5 miles) southeast of the Fukushima nuclear power plant (Geospatial Information Authority of Japan). While the prefecture was not designated a mandatory evacuation zone, many mothers with young children were concerned about radioactive contamination of food and playgrounds. The prefectural government assessed radiation in agricultural and fishery products, and quarantined any food that contained radiation levels with higher than normal background values. They also assessed radiation levels of playground soil and deployed decontamination procedures on ground where radiation levels were abnormal. Nevertheless, this study showed that mothers were not completely reassured by these efforts.

A wide range of support systems should be provided to reduce maternal post-disaster anxiety. For example, continuous support programs in local communities are needed such as the "Mental-Health-Care Team for Children," "Children's Mental Health Counseling," and "Children's Mental Health Counseling Health Checkup," all of which were provided by other areas outside the disaster zones. Also, accurate information should be provided about the physical and mental development of children who have lived through disasters. This could entail psychological guidance or counseling mothers to encourage and empower each other. Support providers should not be limited only to professionals such as clinical psychologists, public health nurses, midwives, and nurses, but ideally would also include radiation specialists who can help those experiencing high levels of anxiety about radiation, as revealed in this study. It would appear feasible to provide periodic local support programs for parents with preschoolers in facilities such as daycare centers, kindergartens, and local child centers because these are sites that host periodic health check-up clinics. Also, we can address the issue of the unavailability of professionals with whom mothers can consult about childrearing, as reported by over half of this study's participants, by establishing outreach support systems where mothers are treated individually with a "high-risk approach" that helps strengthen their resilience.

5. Conclusion

A beneficial way to reduce maternal anxiety in the 12 areas identified would be to develop support systems that

provide continuous support for children's mental health care needs, psychological guidance, community support for maternal empowerment, outreach for individual support, and professional consultation for mothers who have high anxiety about radioactivity.

6. Limitations

Because this study did not employ a control group, we cannot compare our findings with mothers who reside in non-disaster areas.

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