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ORIGINAL RESEARCH

Psychiatric Outpatients After the 3.11 Complex Disaster in Fukushima, Japan

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Abstract

BACKGROUND After the 3.11 complex disaster, fear of radioactive contamination and forced evacuation influenced a number of residents to seek psychiatric care.

OBJECTIVES This study assessed the sequential changes in the number of new outpatients and patients with acute stress disorder (ASD), post-traumatic stress disorder (PTSD), adjustment disorder, and depression after the Fukushima disaster.

METHODS We distributed questionnaires to 77 psychiatric institutions to determine the number of new outpatients between March and June in 2010, 2011, and 2012.

FINDINGS There were 771, 1000, and 733 new patients in 2010, 2011, and 2012, respectively. We observed a statistically significant increase in new patients with ASD or PTSD and a significant decrease in patients with depression in 2011, which returned to predisaster levels in 2012.

CONCLUSIONS There were time- and disease-dependent changes in the numbers of psychiatric care-seeking individuals after the 3.11 complex disaster in Fukushima.

KEY WORDS disaster, nuclear power plant accident, evacuation, acute stress disorder, post-traumatic stress disorder, adjustment disorder, depression, Fukushima

INTRODUCTION

Post-traumatic stress disorder (PTSD) and clinical depression are central concerns in the field of disaster psychiatry. The prevalences of PTSD[1,2] and depression[2] typically increase in the general population after disasters. Studies have also suggested an increased incidence rate of PTSD and depression among evacuees after the Great East Japan Earthquake.[3,4] However, the unavailability of psychiatric care and patients' resistance to treatment have also been reported in previous disasters.[5] The Great East Japan Earthquake

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and subsequent tsunami, which occurred on March 11, 2011, triggered a series of meltdowns and explosions at the Fukushima Daiichi Nuclear Power Plant. Because of the secondary disasters resulting from the earthquake, this event is best described as the 3.11 complex disaster. In addition to the immediate effects of the earthquake and tsunami throughout the northeastern Tohoku region of Japan, the disaster dispersed radioactive contamination in Fukushima Prefecture. Consequently, many individuals experienced prolonged difficulties in daily living because of the long evacuation period, leading to an increase in mental health problems. Research in 2011 on temporary housing residents of Hirono Town,[4] 20 km south of the Fukushima Daiichi Nuclear Power Plant, revealed that 66.8% of residents were acutely depressive according to the Zung Self-rating Depression Scale,[6] and 53.5% were considered at high risk for PTSD as assessed by the revised Impact of Event Scale.[7] The present study surveyed psychiatric institutions regarding the total number of new patients who visited psychiatric outpatient clinics in Fukushima Prefecture 9-12 months before and 0-3 and 12-15 months after the 3.11 complex disaster. This study assessed changes in the numbers of patients diagnosed with acute stress disorder (ASD) or PTSD, adjustment disorder, and depressive episode or other mood disorders after the 3.11 complex disaster. The Ethics Committee of Fukushima Medical University approved this study (No. 1642).

METHODS

Study Population. At the time of the Great East Japan Earthquake on March 11, 2011, there were 91 psychiatric outpatient clinics (psychiatric hospitals, psychiatric clinics, and psychiatric outpatient departments at general hospitals) in Fukushima Prefecture. However, 5 clinics were unable to function after the 3.11 complex disaster. Among the 86 remaining outpatient clinics, we invited psychiatrists from 77 clinics who were members of the Fukushima Society of Psychiatry to participate in our survey of new outpatients. All patients who visited psychiatric outpatient clinics in Fukushima Prefecture for the first time on Wednesdays (Tuesday, if Wednesday was a holiday) between March 12 and June 15 (a 3-month period) in 2010, 2011, and 2012, were included in this study. A survey questionnaire was sent in 2013 to these 77 clinics. The administrators of the participating clinics provided us with written consent to use their responses as data in the present study.

Survey. Psychiatrists at the 77 clinics were asked to report the numbers of new patients enrolled at their clinics on the targeted days of each survey period. In addition, we requested the numbers of patients diagnosed with the following 3 categories of disorders: (a) ASD or PTSD, (b) adjustment disorder, and (c) depressive episode or other mood disorders. An attending psychiatrist clinically diagnosed each individual in accordance with *International Classification of Diseases,* 10th edition (ICD-10)[8] standards.

Statistical Analyses. The data were analyzed in several ways. First, to clarify the sequential changes in the total number of new patients during the survey period (2010, 2011, and 2012), we calculated the ratios of the numbers of 3 categories of disorders (ASD or PTSD, adjustment disorder, and depressive episodes or other mood disorders) for each year against the total numbers of patients for that year. Next, to ascertain the sequential changes in the numbers of new patients in each diagnostic category during the survey period, we performed χ^2 tests using the observed and expected numbers of new patients for each category across the 3 years. The expected numbers per diagnostic category in each year were calculated by multiplying the total number of patients in that category over 3 years by the ratio of the total number of new patients for that year and total new patients over 3 years. Multiple comparisons using exact binomial tests were performed using the observed and expected numbers of patients between 2010 and 2011, 2011 and 2012, and 2010 and 2012 for all categories for which the χ^2 tests revealed significant differences between the observed and expected frequencies across the 3 years. When conducting the exact binomial tests, we first calculated the expected patient frequencies for each category and year, allotting numbers of patients for each year by dividing the total number of patients for the relevant categories according to the ratios of the total number of patients of the corresponding year / total number of patients of all 3 years. The observed and expected frequencies for categories with significant differences in χ^2 tests were compared between 2010 and 2011, 2011 and 2012, and 2010 and 2012. We used the Benjamini-Hochberg method for P value adjustment in these tests.[9]

RESULTS

Overview of New Outpatients. Forty of the 77 psychiatric institutions provided valid responses. One participating clinic was located in the northern

Annals of Global Health, VOL. 82, NO. 5, 2016
September–October 2016: 798–805

Pacific coast area of Fukushima Prefecture, where the disaster's effects were severe and almost all psychiatric clinics and hospitals were forced to shut down after the disaster. Because the number of patients who visited this clinic was likely to be affected by the lack of other regional clinics, we excluded patients from this clinic from further analyses. Thus, data from 39 institutions were included in the final analyses.

The total numbers of new outpatients and patients with ASD or PTSD, adjustment disorder, and depressive episode or other mood disorders are shown in Table 1.

There were 771, 1000, and 733 new patients in 2010, 2011, and 2012, respectively, in 39 institutions during the survey period. Of these, 9, 49, and 16 patients were diagnosed with ASD or PTSD, respectively. A total of 79, 95, and 89 patients were diagnosed with adjustment disorder in the same period. Likewise, 198, 158, and 155 patients were diagnosed with depressive episodes or other mood disorders. Of all new outpatients in 2010, the rate of diagnosis of ASD or PTSD was 1.2%; adjustment disorder, 10.2%; and depressive episode or other mood disorders, 25.7%. Similarly, for all new outpatients in 2011, the rates for the 3 diagnostic categories were 4.9%, 9.5%, and 15.8%, respectively. The rates in 2012 were 2.2%, 12.1%, and 21.1%, respectively.

Sequential Changes in the Number of Patients Diagnosed With ASD or PTSD. The sequential changes in the number of new outpatients diagnosed with ASD or PTSD are shown in Table 2.

Seventy-four patients had ASD or PTSD during the 3-year study period. Of these, 9 (12.2%), 49 (66.2%), and 16 (21.6%) were new patients in 2010, 2011, and 2012, respectively. As shown in Table 1, there were 771 (30.8%), 1000 (39.9%), and 733 (29.3%) new patients, respectively (2504 total patients). The expected frequencies of patients with ASD or PTSD were 22.8, 29.6, and 21.7, respectively. χ^2 tests revealed a significant difference between the observed and expected frequencies of the 3 years ($\chi^2[2] = 22.61$, $P = .000$; Table 2).

Based on the statistically significant differences for ASD and PTSD, multiple comparisons were made using exact binomial tests with the 2010:2011, 2011:2012, and 2010:2012 ratios of the observed and expected patient frequencies. In 2010 and 2011, there were 9 and 49 patients with ASD or PTSD, respectively. The ratios of the observed and expected frequencies in 2010 and 2011 were 9:49 (15.5%:84.5%) and 22.8:29.6 (43.5%:56.5%), respectively. An exact binomial test between the observed and expected ratios revealed a statistically significant difference ($P = .000$; Table 2), in which the observed frequency of ASD or PTSD in 2011 was significantly greater than that in 2010.

There were 9 and 16 patients with ASD or PTSD in 2010 and 2012, respectively. The ratios of the observed and expected frequencies of 2010 and 2012 were 9:16 (36.0%:64.0%) and 22.8:21.7 (51.2%:48.8%), respectively. An exact binomial test between the observed and expected ratios revealed no significance ($P = .161$; Table 2). Thus, there was no significant difference in the ratios of the observed and expected frequencies of 2010 and 2012.

Finally, we compared 2011 and 2012, during which 49 and 16 patients were diagnosed with ASD or PTSD. The ratios of the observed and expected frequencies in these years were 49:16 (75.4%:24.6%) and 29.6:21.7 (57.7%:42.3%), respectively. An exact binomial test between the observed and expected ratios revealed a statistically significant difference ($P = .006$; Table 2), in which the observed frequency in 2011 was significantly greater than that of 2012.

Sequential Changes of the Number of Patients Diagnosed With Adjustment Disorder. The sequential changes in the numbers of new outpatients diagnosed with adjustment disorder are shown in Table 3.

A total of 263 patients were diagnosed with adjustment disorder during the study period, including 79 (30.0%), 95 (36.1%), and 89 (33.8%) in 2010, 2011, and 2012, respectively. As shown in Table 1, the total numbers of new patients were 771 (30.8%), 1000 (39.9%), and 733 (29.3%), respectively. The expected frequencies of patients diagnosed with adjustment disorder were

Table 1. Overview of the Number of New Outpatients per Year

	2010	2011	2012
All new patients, n	771	1000	733
ASD (F43.0) or PTSD (F43.1), n (%)*	9 (1.2)	49 (4.9)	16 (2.2)
Adjustment disorder (F43.2), n (%)*	79 (10.2)	95 (9.5)	89 (12.1)
Depressive episode (F32, F33) or other mood disorders (F38), n (%)*	198 (25.7)	158 (15.8)	155 (21.1)

ASD, acute stress disorder; PTSD, post-traumatic stress disorder.
* n (%) = percentage of all new patients for each year.

Table 2. Sequential Changes in the Number of New Patients Diagnosed With ASD or PTSD

Patients in Selected Periods	Observed or Expected Frequency	2010	2011	2012	Total	χ^2 Value	*P*
Patients with ASD or PTSD in all periods	Observed frequency (%)*	9 (12.2)	49 (66.2)	16 (21.6)	74	22.61	.000
	Expected frequency† (%)‡	22.8 (30.8)	29.6 (39.9)	21.7 (29.3)			
2010 vs 2011 (binomial)	Observed frequency (%)§	9 (15.5)	49 (84.5)		58		.000¶
	Expected frequency (%)‖	22.7 (43.5)	29.6 (56.5)				
2010 vs 2012 (binomial)	Observed frequency (%)§	9 (36.0)		16 (64.0)	25		.161¶
	Expected frequency (%)‖	22.8 (51.2)		21.7 (48.8)			
2011 vs 2012 (binomial)	Observed frequency (%)‖		49 (75.4)	16 (24.6)	65		.006¶
	Expected frequency (%)‖		29.56 (57.7)	21.66 (42.3)			

ASD, acute stress disorder; PTSD, post-traumatic stress disorder.
* Ratio of patients with ASD or PTSD for each year to the total number of ASD or PTSD patients for all periods.
† The expected frequency of patients with ASD or PTSD for a particular year was determined by assigning the total number of patients (74) to that year according to the year's ratio of new patients to the total number of new patients across 3 years.
‡ The ratio for each year was calculated by dividing the number new patients for that year by the total number of new patients across 3 years (n = 2504).
§ The ratio for a particular year was calculated by dividing the observed patient number for that year by the total number of patients over 2 years.
‖ The ratio for a particular year was calculated by dividing the expected patient number for that year by the total number of patients for 2 years.
¶ *P* value after exact binomial test (*P* value adjusted using the Benjamini-Hochberg procedure).

81.0, 105.0, and 77.0, respectively. A χ^2 test using the observed and expected frequencies of patients with adjustment disorder in 2010, 2011, and 2012 revealed no significant differences ($\chi^2[2] = 2.885$, $P = .236$; Table 3). Therefore, we did not analyze the data further for possible differences in the observed and expected frequencies of patients among 2010, 2011, and 2012.

Sequential Changes in the Number of Patients Diagnosed With Depressive Episodes or Other Mood Disorders. The sequential changes in the numbers of new outpatients diagnosed with depressive episode or other mood disorders are shown in Table 4.

A total of 511 patients were diagnosed with depressive episode or other mood disorders during the study period, including 198 (38.8%), 158 (30.9%), and 155 (30.3%) patients in 2010, 2011, and 2012, respectively. The expected frequencies of new patients with depressive episode or other mood disorder were 157.3, 204.1, and 149.6 patients, respectively. A χ^2 test using the observed and expected frequencies of depressive episode or other mood disorder patients in 2010, 2011, and 2012 revealed a significant difference ($\chi^2[2] = 21.12$, $P = .000$; Table 4).

Based on this statistically significant finding, we performed multiple comparisons of the observed and expected frequencies between 2010 and 2011, 2011 and 2012, and 2010 and 2012, as performed in the multiple comparisons for ASD or PTSD and adjustment disorder as described in the previous sections. As a result, an exact binomial test between the observed and expected ratios of 2010 and 2011 revealed a statistically significant difference ($P = .000$; Table 4), with the observed frequency of depressive episode or other mood disorders in 2011 significantly smaller than that in 2010.

In 2010 and 2012, an exact binomial test between the observed and expected ratios revealed no significance ($P = .071$; Table 4). Thus, there was no significant difference in the ratios of the

Table 3. Sequential Changes in the Number of New Patients Diagnosed With Adjustment Disorder

Patients in Selected Periods	Observed or Expected Frequency	2010	2011	2012	Total	χ^2 Value	*P*
Patients with adjustment disorder in all periods	Observed frequency (%)*	79 (30.0)	95 (36.1)	89 (33.8)	263	2.89	.236
	Expected frequency† (%)‡	80.98 (30.8)	105.04 (39.9)	76.98 (29.3)			

* The adjustment disorder patients ratio for each year to the total number of adjustment disorder patients for all periods.
† The expected frequency of patients with adjustment disorder for a particular year was determined by assigning total number of patients, 263, to that year according to the year's ratio of new patients to the total number of new patients across 3 years.
‡ The ratio for each year was calculated by dividing the number new patients for that year by the total number of new patients across 3 years (n = 2504).

Annals of Global Health, VOL. 82, NO. 5, 2016
September–October 2016: 798–805

Table 4. Sequential Changes in the Number of New Patients Diagnosed With Depressive Episode or Other Mood Disorders

Patients in Selected Periods	Observed or Expected Frequency	2010	2011	2012	Total	χ^2 Value	*P*
Depressive patients in all periods	Observed frequency (%)*	198 (38.8)	158 (30.9)	155 (30.3)	511	21.12	.000
	Expected frequency† (%)‡	157.3 (30.8)	204.1 (39.9)	149.6 (29.3)			
2010 vs 2011 (binomial)	Observed frequency (%)§	198 (55.6)	158 (44.4)		356		.000¶
	Expected frequency (%)‖	157.3 (43.5)	204.1 (56.5)				
2010 vs 2012 (binomial)	Observed frequency (%)§	198 (56.1)		155 (43.9)	353		.071¶
	Expected frequency (%)‖	157.3 (51.3)		149.6 (48.7)			
2011 vs. 2012 (binomial)	Observed frequency (%)§		158 (50.5)	155 (49.5)	313		.015¶
	Expected frequency (%)‖		204.1 (57.7)	149.6 (42.3)			

* Ratio of the number of patients with depressive episode or other mood disorders for each year to the total number of patients with depressive episode or other mood disorders for all periods.
† The expected frequency of patients with depressive episode or other mood disorders for a particular year was determined by assigning total number of patients, 511, to that year according to the year's ratio of new patients to the total number of new patients across 3 years.
‡ The ratio for each year was calculated by dividing the number new patients for that year by the total number of new patients across 3 years (n = 2504).
§ The ratio for a particular year was calculated by dividing the observed patient number for that year by the total number of patients over 2 years.
‖ The ratio for a particular year was calculated by dividing the expected patient number for that year by the total number of patients for 2 years.
¶ *P* value after an exact binomial test (*P* value adjusted using the Benjamini-Hochberg procedure).

observed and expected frequencies of 2010 and 2012.

Finally, we compared 2011 and 2012, with an exact binomial test between the observed and expected ratios revealing a statistically significant difference ($P = .015$; Table 4). Thus, the observed frequency in 2012 was significantly greater than that of 2011.

DISCUSSION

We obtained data from 39 of 86 psychiatric outpatient clinics (45%) that continued operating after the 3.11 complex disaster in Fukushima Prefecture. Therefore, the results of the present study are nearly representative of the prefecture-wide trends in new outpatients during the observation period.

The earthquake and subsequent tsunami led to the nuclear power plant accident and radioactive contamination of areas around Fukushima in March 2011. As of the end of 2015, there were approximately 99,000 evacuees in Fukushima Prefecture.[10] The prolonged evacuation and fear of radiation contamination have caused significant psychological distress among residents of Fukushima, which may have resulted in the disaster-related deaths of about 2000 individuals[11] and more than 80 disaster-related suicides as of the end of 2015.[12]

Immediately after the 3.11 complex disaster, people in Fukushima experienced heightened psychological stress, which led to changes in their psychiatric care needs. The present study tracked the increase in these needs as a function of time elapsed after the disaster.

Main Findings. Our study compared the numbers of patients visiting psychiatric outpatient clinics for the first time in 2011 and 2012 in Fukushima Prefecture after the 3.11 complex disaster with the numbers of new outpatients in the predisaster year of 2010. The postdisaster numbers of new psychiatric patients increased from 771 in 2010 to 1000 in 2011 but returned to 733 in 2012 (Table 1). Of these new psychiatric patients, the percentage of ASD or PTSD increased in 2011 but returned to predisaster levels in 2012 (1.2%, 4.9%, and 2.2% in 2010, 2011, and 2012, respectively; Table 2). We found no significant sequential changes in the number of patients diagnosed with adjustment disorder during the survey period (Table 3). The numbers of patients with depressive episodes or other mood disorders decreased in 2011 and increased slightly in 2012, similar to the numbers in 2010 (Table 4).

This study investigated changes in trends of new outpatients after the 3.11 complex disaster. For this reason, we used the number of new patients in 2010 as the predisaster baseline. However, it was first necessary to determine if our 2010 data were appropriate to use as a reference. For this reason, we tried to compare the number of new psychiatric outpatients in 2010 in the present study with nationwide data but were unable to find nationwide survey data of the number of new patients classified using the ICD-10 categories that could be used as controls in the present study. However, patient surveys are

conducted by the Japanese Ministry of Health, Labour and Welfare every 3 years. These patient surveys investigate the number of individuals undergoing medical treatment nationwide for diseases based on ICD categorization on a single day of the year. The patient survey investigates the total number of patients who received treatment on the survey day, including new and revisiting patients. The most recent patient survey before the disaster was conducted in 2008. The results of the major categories of ICD-10 such as F3 (mood [affective] disorders) or F4 (neurotic, stress-related, and somatoform disorders) have been published,[13] but there are no data concerning subcategories like PTSD, ASD, or adjustment disorder within F4 or of depressive episodes within F3, and there are no data for other types of depression. The usable data from 2008 revealed that 232,300 patients received psychiatric treatment on the target day, with 80,100 (34.5%) and 49,600 (21.4%) classified as F3 and F4, respectively. The 2010 results in the present study revealed that 25.7% of patients were diagnosed with depressive episode or other types of depression in F3, compared with the 34.5% of F3 patients in the 2008 survey. Thus, these findings suggest no notable differences. Because there were no data specifically regarding ASD, PTSD, or adjustment disorder in the 2008 patient survey results, we were unable to compare these 3 items with the results of the present study.

Comparison With Previous Studies on Postdisaster Trends in PTSD and Depression. The results of the Fukushima Health Management Survey for 2011 and 2012, a self-administered questionnaire conducted by Fukushima Prefecture and Fukushima Medical University that targeted individuals from the mandatory evacuation zone (ie, a 20-km radius around Fukushima Daiichi Nuclear Power Plant and other polluted areas), revealed that the frequencies of evacuees suspected of having PTSD or depression were high in 2011.[14] Moreover, these increases continued into 2012, though a slight decrease was observed in comparison with 2011.[15] The Fukushima Health Management Survey[3] revealed that 14.6% of all evacuees in 2011 and 11.9% in 2012 were significantly distressed (defined as scoring more than 13 points on the Kessler Screening Scale for Psychological Distress[16]), much higher than the 2.9% reported among the Japanese general population.[17] In addition, 21.6% and 18.3% of respondents in 2011 and 2012, respectively, showed signs of PTSD (defined as more than 44 points on the PTSD Checklist[18]), also much higher than the estimated 1%-3% prevalence in the general population in Japan.[19] Additionally, a 2011 study on temporary housing residents of Hirono Town, 20 km south of Fukushima Daiichi Nuclear Power Plant, reported that 66.8% of residents were depressive and 53.5% were at high risk for PTSD.[4]

Surveys after disasters worldwide have revealed a continuing trend of increasing prevalence of PTSD or depression in residents 2-3 years after the disaster.[1,2] The prevalences of PTSD and depression among 1355 residents 30 months after the 2010 Haiti earthquake were 36.75% and 25.98%, respectively.[2] In addition, after the Wenchuan earthquake in China, the prevalence of PTSD 2 months after the disaster was 58.2%, compared with 22.1%, 19.8%, 19.0%, 8.0% at 8, 14, 26, and 44 months later, respectively.[1] Our survey is consistent with previous studies that reported increased PTSD 1 year after the disaster but inconsistent with other studies in that the number of PTSD patients returned to predisaster levels 2 years after the disaster. Additionally, to the best of our knowledge, the decrease in the number of depressed patients we observed 1 year after disasters has not been previously reported.

Potential Reasons for the Inconsistencies With Previous Findings. The inconsistencies between the present study and previous reports regarding the transient increase in the number of PTSD patients, which returned to predisaster levels 1 year later, as well as the decreased number of depressed patients in the year of the 3.11 complex disaster in Fukushima are intriguing. However, there is an important difference between this study and previous reports. Whereas the present study was based on the numbers of actual clinical visitors, most previous reports were predicated on community surveys based on self-administered questionnaires. Studies relying on self-administered questionnaires to identify individuals with conditions such as post-traumatic reactions or depression may overestimate the rates of PTSD or major depressive disorders. Surveys that observe sharp increases in postdisaster depression based on self-administered questionnaires may include individuals with subclinical or even clinically insignificant distress who do not require treatment.

As discussed earlier, there are 2 possible explanations for the inconsistency in findings between the present study and previous reports. First, most postdisaster investigations on psychiatric disorders lack data concerning predisaster prevalence. Therefore, it is often difficult to establish an

Annals of Global Health, VOL. 82, NO. 5, 2016
September–October 2016: 798–805

appropriate control group for comparison. This issue was raised by a study of Swedish survivors of the Southeast Asian tsunami in 2004.[20] Sweden has population registries of health care utilization and medical diagnosis for every resident, thereby providing predisaster prevalence data. In that study, the number of patients with mood or anxiety disorders did not increase after the tsunami, although stress-related disorders (including PTSD) and suicide attempts did increase. Thus, assessment of the effects of disasters requires data from predisaster periods.

Our second hypothesis relates to the cultural and social factors. After the 3.11 complex disaster, altruistic feelings of unity and nationalistic eagerness for recovery prevailed in Japan, along with worldwide support. Many residents in disaster-stricken areas may have had a heightened sense of purpose to overcome the threat of radiation exposure and to rebuild their hometowns. Moreover, residents were generally encouraged to express their anger or frustrations concerning the nuclear power plant accidents. This situation might have empowered residents suffering from the effects of the complex disaster. Haglund et al[21] identified 6 resilience factors that protect against and aid recovery from posttraumatic stress, including active coping, physical exercise, positive outlook, moral compass, social support, and cognitive flexibility. Individuals living in Fukushima after the disaster may have benefitted from active coping styles, moral compasses, and social support. Therefore, even though ASD and PTSD, adjustment disorder, depressive episodes, and other mood disorders increased in the general population after the disaster, some individuals may have recovered without seeking treatment at medical institutions.

However, there is a potential downside to a culture of active coping, as there has been a reported increase in the incidence of manic excitement in Fukushima Prefecture after the disaster.[22] It is possible that sociocultural factors that have contributed to the decreased incidence of depression have also exacerbated manic excitement. Manic excitement may make individuals insensitive to distress and cause them to remain active, which might conceal post-traumatic reactions such as ASD, PTSD, or depression.

Implications. Untreated ASD, PTSD, or depression could lead to serious adverse outcomes such as psychiatric disease progression, alcohol use disorder, and suicide. After the 3.11 complex disaster, Ohto et al[23] reported standardized suicide mortality ratios in Fukushima Prefecture, calculated as described by Broeck et al.[24] The standardized suicide mortality ratios were 108, 107, 94, and 96 in 2010-2013, respectively.[23] Increased numbers of suicides were not observed immediately after the disaster, and in fact decreased to 94 and 96 in 2012 and 2013, respectively. However, the standardized suicide mortality ratio increased to 126 in 2014. A similar increase in suicides was observed 3 years after the 1995 Hanshin-Awaji earthquake.[25] Therefore, continued promotion of mental health care and improved accessibility are necessary in disaster-affected areas. At the same time, future studies are necessary to explore our hypothesis that resilience factors may have played a role in mitigating the mental health impact of the 3.11 complex disaster and to use these findings to inform ongoing interventions in post-3.11 Japan and in future disasters.

SURVEY LIMITATIONS

Participating psychiatrists used the ICD-10 as the diagnostic criteria. However, they were not asked to use semistructured interview systems, which may have compromised the diagnostic validity and reliability of the findings of the current study. In addition, we limited the study periods to 3 months per year and 1 day per week. The reason for this limited study period was out of consideration for the workload of the participating psychiatrists. This consideration might have affected our sample size.

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to Karada Clinic, Murakami Hospital, Nanko Kokoro no Clinic, Nishishirakawa Hospital, Nishiguchi Heart Clinic, Nomura Kanseido Clinic, Ohno Clinic, Ogata Mental Clinic, Ota Mental Clinic, Sakuragaoka Hospital, Sakaemachi Clinic, Shimizu Hospital, Shirakawa Kousei Hospital, Stress Clinic, Sugano Clinic, Takada Kousei Hospital, Tohoku Hospital, Yagiuchi Clinic, Yoshijima Hospital.

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