

The Great East Japan Earthquake Disaster and cardiovascular diseases

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Aims

While previous studies reported a short-term increase in individual cardiovascular disease (CVD) after great earthquakes, mid-term occurrences of all types of CVDs after great earthquakes are unknown. We addressed this important issue in our experience with the Great East Japan Earthquake (11 March 2011).

Methods and results

We retrospectively examined the impact of the Earthquake on the occurrences of CVDs and pneumonia by comparing the ambulance records made by doctors in our Miyagi Prefecture, the centre of the disaster area, during the periods of 2008–11 ($n = 124\,152$). The weekly occurrences of CVDs, including heart failure (HF), acute coronary syndrome (ACS), stroke, cardiopulmonary arrest (CPA), and pneumonia were all significantly increased after the Earthquake compared with the previous 3 years. The occurrences of ACS and CPA showed the rapid increase followed by a sharp decline, whereas those of HF and pneumonia showed a prolonged increase for more than 6 weeks and those of stroke and CPA showed a second peak after the largest aftershock (7 April 2011). Furthermore, the occurrence of CPA was increased in the first 24 h after the Earthquake, followed by other diseases later on. These increases were independent of age, sex, or residence area (seacoast vs. inland).

Conclusion

These results indicate that the occurrences of all types of CVDs and pneumonia were increased in somewhat different time courses after the Earthquake, including the first observation of the marked and prolonged increase in HF, emphasizing the importance of intensive medical management of all types of CVDs after great earthquakes.

Keywords

Earthquake • Cardiovascular disease • Heart failure • Tsunami

Introduction

On 11 March 2011, the Great East Japan Earthquake hit the north-east part of Japan with a magnitude of 9.0 on the Richter scale, which was one of the largest ocean-trench earthquakes ever recorded in Japan (Table 1).¹ The Earthquake caused huge damage, including 15 861 dead, 3018 missing persons, and 388 783 destroyed houses as of 6 June 2012.² It forced many people (~400 000) to be evacuated to temporary accommodation, such as public halls, gymnastic halls, and scholastic institutions in North-east Japan. Since the Earthquake occurred with its epicentre located at 38° latitude, 19 min North, and 142° longitude, 22 min East, our Miyagi Prefecture with a population of 2 348 165 was the closest area to the epicentre (Figure 1A), where there was the largest amount of damage and number of victims, including

9512 dead, 1581 missing persons, and 232 553 destroyed houses as of 8 May 2012,^{2,3} and most of the damage was observed in the seacoast area, including 9506 dead (95.8%), 1578 missing persons (99.8%) and 222 880 destroyed houses (95.8%).

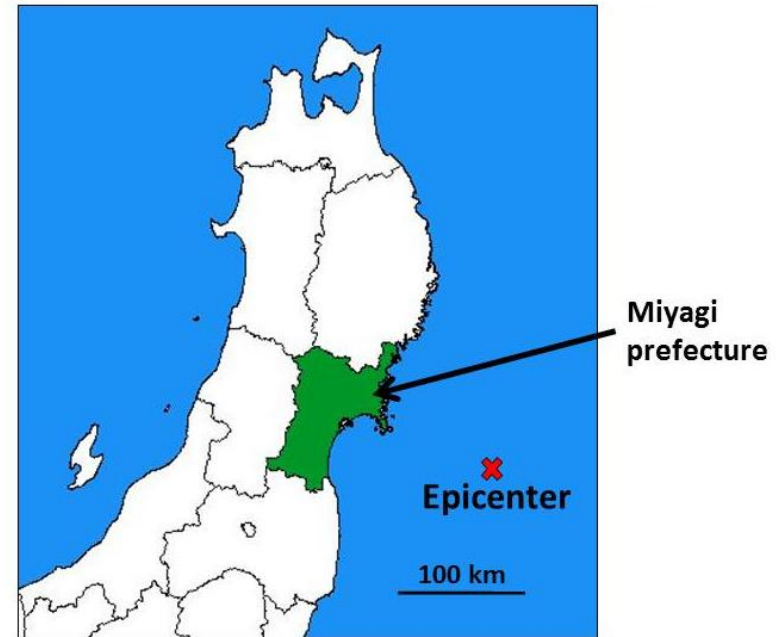
It has been previously reported that the occurrences of acute coronary syndrome (ACS), stroke, pulmonary embolism, and takotsubo cardiomyopathy were increased after the large earthquakes in Japan (Table 1).^{4–9} Furthermore, it has been reported that the occurrences of sudden cardiac death and haemodynamically unstable ventricular tachyarrhythmias were increased after the Northridge Earthquake in California, USA, and the Wenchuan Earthquake in China, respectively (Table 1).¹⁰ Thus, the previous reports have revealed that the occurrences of various cardiovascular diseases (CVDs) were increased after large earthquakes. However, these studies reported only the

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Background and Study Design

1. **The Great East Japan Earthquake** attacked East Japan, including Miyagi prefecture, on March 11, 2011.
(Dead: 15,857, Missing; 3,057)



2. To clarify the impact of the Earthquake on the occurrences of CVDs, we examined ambulance transport records in the Miyagi prefecture.

Previous Earthquakes and CVDs

Place of the Earthquake (Country)	Year	Magnitude	Temperature (°C, Hi/Lo)	No. of deaths	No. of injured	Diseases increased
No information is available on the occurrences of CVDs; 1. A large population 2. Longer follow-up period 3. All major CVDs						
Mid-Niigata (Japan)	2004	6.8	26.4/22	68	4,805	TC, PE, Sudden deaths
Wenchuan (China)	2008	7.9	25.0/17	69,197	18,222	VT/Vf
East Japan (Japan)	2011	9.0	6.2/-2.5	15,845	5,894	?

TC: takotsubo cardiomyopathy, PE: pulmonary embolism

Methods

Materials and study period

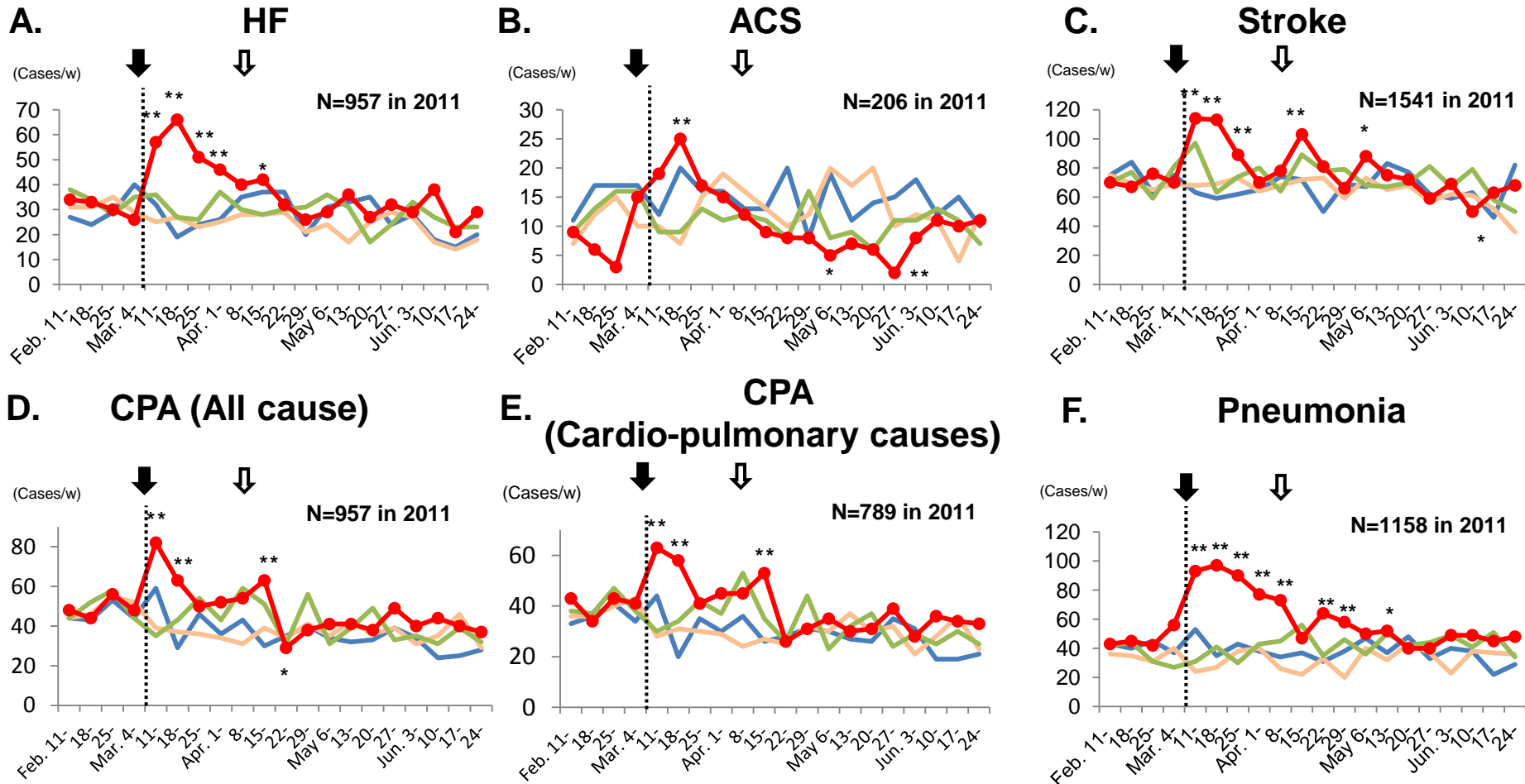
1. Ambulance transport records obtained from all 12 fire departments in the Miyagi prefecture (**2.3 million**).
2. Study period: 11 Feb. to 30 Jun. (**15 weeks**) in 2008-2011. (**N=124,152**)

Diseases examined in this study

5 Major diseases; HF, ACS (AMI and UAP), Stroke, Cardiopulmonary arrest, Pneumonia

Main Results

-Weekly occurrences of the 5 diseases-



↓ : The Great East Japan Earthquake (magnitude of 9.0, March 11, 2011)

⇓ : The largest aftershock (magnitude of 7.0, April 11, 2011)

(*P<0.05, **P<0.01)