Acute and Subacute Effects of the Great East Japan Earthquake on Home Blood Pressure Values

To the Editor:

The Great East Japan Earthquake hit northeast Japan at 2:46 PM on March 11, 2011, resulting in >20,000 dead or missing persons. Previous studies demonstrated that an increased incidence of cardiovascular disease was prolonged until a few months after the Hanshin-Awaji earthquake.¹ ² This could be explained by increased blood viscosity attributed to diminished water intake, by activation of the coagulation system, and especially by elevated blood pressure (BP).³ However, in most previous studies, BP was measured by office BP, which is influenced by observer bias and the so-called white-coat effect. The self-measured BPs in the morning at home (home BP) measurements are reportedly more reliable than office BP, avoid both observer and regression dilution biases, and can provide information on daily BP under relatively controlled conditions. Thus, in an outpatient clinic located in Sendai, which is one of the devastated cities in northeastern Japan, we surveyed changes in home BP before and after the earthquake in hypertensive patients who have measured their home BP customarily.

We obtained home BP in 142 hypertensive patients whose treatment status of hypertension or antihypertensive drugs had not been changed. Home BP was measured using the semiautomatic HEM-747IC-N (Omron Healthcare, Kyoto, Japan), a device based on the cuff-oscillometric method that generates a digital display of both systolic and diastolic BP values that were stored in integrated circuit memory.³ The patients had been instructed how to use the device. They measured their own BP once in the morning, in the sitting position within 1 hour after awaking and after 2 minutes of rest, and have experienced measurements of home BP for ≥1 year.⁴ Home BP in the morning was averaged for the 5 days immediately before, immediately after, 2 weeks after, and 4 weeks after the earthquake.

The 142 hypertensive outpatients were aged 68.1±8.8 years and included 84 men (59.2%). Among the 140 patients, 138 were on antihypertensive medication, and their mean number of antihypertensive medications used was 2.77±1.14 drugs per day (range: 1–5 drugs per day). Compared with immediately before the earthquake, average home systolic BP, but not diastolic BP, was significantly elevated immediately after the earthquake (126.9±8.9 versus 129.3±9.6 mm Hg, P=0.004 for systolic; 74.9±7.5 versus 75.8±8.0 mm Hg, P=0.05 for diastolic). This elevation of home systolic BP remained significant 2 weeks after (128.5±9.2 mm Hg, P=0.03) but disappeared 4 weeks after the earthquake (126.0±9.8 mm Hg, P=0.2). Home heart rate was also significantly elevated immediately after the earthquake (63.1±8.5 versus 64.1±7.8 bpm; P=0.01), and it returned to its previous level 2 weeks after (63.4±8.4 bpm; P=0.3). Of the 142, 10 patients (mean age: 66.6±5.6 years; men: 60%; the mean number of antihypertensive drugs: 3.0±1.33) measured their home BP on the morning of the day of the earthquake and for the following 3 consecutive days. Steep elevations of home BPs were observed; the differences in home BPs between the day of and the day after the earthquake were +11.6±2.6 mm Hg for systolic (P=0.02), +3.9±7.9 mm Hg for diastolic (P=0.2), and +4.7±5.8 bpm for heart rate (P=0.03; Figure).

Home BP was greatly elevated immediately after the earthquake and gradually decreased over a month. There were 1 study⁵ indicating inconsistent results. They reported that the elevation of home BP after the earthquake was only temporary at the Great Hanshin Awaji Earthquake in western Japan on January 17, 1995.⁵ However, their study was based on a small sample size (16 hypertensive patients living within 50 km from the epicenter).

Suzuki et al⁶ reported that, after the Great Hanshin Awaji Earthquake, the incidence of acute myocardial infarction increased steeply during the first week and decreased gradually after 4 weeks. From our current results, this increased incidence of myocardial infarction might be partly caused by acute and subacute elevation of BP after the earthquake. The prolonged elevation of BP might be caused by stress from the earthquake, aftershocks, housing damage, or family misfortune. In addition, excess dietary salt intake might also affect the chronic elevation in home BP, because relief foods can contain high salt to preserve food from decay.

Our results were observed in hypertensive patients who could measure their own BP. However, there were many victims who were unable to measure their BP at home because of loss of their

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**Figure.** Measured home blood pressures (BPs) and heart rates just before and after the earthquake in 10 patients who measured their BP in the morning before the earthquake and during the 3 subsequent days after the earthquake.

**Table.** Changes in home blood pressure values (mean±standard error) before and after the Great East Japan Earthquake.

<table>
<thead>
<tr>
<th>Date</th>
<th>Systolic</th>
<th>Diastolic</th>
<th>Heart rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>126.9</td>
<td>74.9</td>
<td>63.1</td>
</tr>
<tr>
<td>Immediately after</td>
<td>129.3</td>
<td>75.8</td>
<td>64.1</td>
</tr>
<tr>
<td>2 weeks after the earthquake</td>
<td>128.5</td>
<td>75.8</td>
<td>63.4</td>
</tr>
<tr>
<td>4 weeks after the earthquake</td>
<td>126.0</td>
<td>75.8</td>
<td>63.4</td>
</tr>
</tbody>
</table>

**Graph.** The daily home blood pressure values (mmHg) for systolic, diastolic, and heart rate before, immediately after, and 2 weeks after the Great East Japan Earthquake.

**Note:** The day of the earthquake was March 11, 2011.

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equipment in the earthquake and tsunami. Their BP might have been even further elevated than the BP observed in the present study. Our observations indicate the need for urgent intervention related to elevated BP levels in victims of earthquakes immediately and for ≥1 month after a disaster.

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