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 \(\geq\)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 mmHg, \(P=0.004\) for systolic; 74.9±7.5 versus 75.8±8.0 mmHg, \(P=0.05\) for diastolic). This elevation of home systolic BP remained significant 2 weeks after (128.5±9.2 mmHg, \(P=0.03\)) but disappeared 4 weeks after the earthquake (126.0±9.8 mmHg, \(P=0.2\)). 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 mmHg for systolic (\(P=0.02\)), +3.9±7.9 mmHg 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 study\(^5\) 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\(^5\) was based on a small sample size (16 hypertensive patients living within 50 km from the epicenter).

Suzuki et al\(^1\) 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

(Hypertension. 2011;58:e193-e194.)

© 2011 American Heart Association, Inc.

Hypertension is available at http://hyper.ahajournals.org

DOI: 10.1161/HYPERTENSIONAHA.111.184077

e193
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.

Acknowledgment
We are grateful to the staff members of this study.

Sources of Funding
This study was supported by the Sendai Knowledge Cluster Initiative (Sendai, Japan).

Disclosures
None.

Michihiro Satoh
Masahiro Kikuya
Department of Planning for Drug Development and Clinical Evaluation
Tohoku University Graduate School of Pharmaceutical Sciences and Medicine
Sendai, Japan

Takayoshi Ohkubo
Department of Planning for Drug Development and Clinical Evaluation
Tohoku University Graduate School of Pharmaceutical Sciences and Medicine
Sendai, Japan

Yutaka Imai
Department of Planning for Drug Development and Clinical Evaluation
Tohoku University Graduate School of Pharmaceutical Sciences and Medicine
Sendai, Japan

References
Acute and Subacute Effects of the Great East Japan Earthquake on Home Blood Pressure Values
Michihiro Satoh, Masahiro Kikuya, Takayoshi Ohkubo and Yutaka Imai

*Hypertension*. 2011;58:e193-e194; originally published online October 31, 2011; doi: 10.1161/HYPERTENSIONAHA.111.184077

*Hypertension* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2011 American Heart Association, Inc. All rights reserved.
Print ISSN: 0194-911X. Online ISSN: 1524-4563

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://hyper.ahajournals.org/content/58/6/e193

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in *Hypertension* can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to *Hypertension* is online at:
http://hyper.ahajournals.org//subscriptions/