Follow-up after the Hanshin-Awaji Earthquake: Diverse Influences on Pneumonia, Bronchial Asthma, Peptic Ulcer and Diabetes Mellitus

Rena Takakura, Seiichi Himeno, Yoshio Kanayama, Takashi Sonoda, Kazuo Kiriyama, Takayasu Furubayashi, Michihiro Yabu, Shingo Yoshida, Yutaka Nagasawa, Shinya Inoue and Norihito Iwao

We evaluated the influence of the Hanshin-Awaji earthquake on the patients in our internal medicine department. After the initial rush of patients with injury, the number of respiratory diseases, largely pneumonia, increased within one month. This same event, however, seemed to decrease attacks among asthma patients. During the following three months, the number of peptic ulcer patients increased: 39.5% had a giant gastric ulcer and 34.8% had bleeding complications. Diabetic control of outpatients became worse after the earthquake. It is important to recognize that various disorders involving physical and psychological problems develop at different stages after a large-scale disaster.

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Introduction

On January 17, 1995, the Hanshin-Awaji earthquake struck the southern area of Hyogo Prefecture, Japan. Of 86,000 Ashiya citizens, over 400 were killed in the catastrophe. More than 50% of the houses and buildings in Ashiya city were destroyed. Because Ashiya Municipal Hospital escaped severe structural damage, we were able to accept many injured patients soon after the earthquake. A total of 322 patients came on the first day: 50 were dead-on-arrival, 208 were admitted because of trauma, 23 required immediate transfer for further intensive care, and 41 needed first-aid treatment alone. In addition to these cases with surgical injury, we had to manage many acute and chronic diseases in the department of internal medicine. This report describes how the disaster influenced the patients who visited our department.

Clinical Report

Our Internal Medicine department, with a capacity of 150 beds, usually accepts about one hundred hospital patients per month. Figure 1 shows the monthly summary of the patients who were admitted to our department before and after the earthquake; the summary excludes patients with orthopedic or surgical problems. The increase in the number of hospitalized patients within the first month was attributed largely to the increased number of patients with respiratory diseases. Patients
with gastrointestinal diseases, though not increased in number, included an unusually high number of cases of peptic ulcer. In our hospital, unlike the Awaji-Hospital (1, 2), few cardiovascular diseases were encountered. These patient profiles centered around the earthquake were compared with those of the past two years. As seen in Fig. 2, the influence of the earthquake was most prominent in patients with respiratory diseases. Detailed clinical features are separately summarized below.

**Respiratory diseases**

The number of patients with respiratory diseases increased about 4.5-fold right after the earthquake. As seen in Fig. 3, infectious diseases comprised more than half of these respiratory disease patients who were admitted to our hospital during the first month after the earthquake: pneumonia was diagnosed on the basis of positive X-ray findings and upper respiratory tract infection/bronchitis with negative results. The increase of respiratory disease, most prominently pneumonia, resolved within 2 months. In February 1995, a total of 24 pneumonia patients were admitted with an average age of 79 years old (ranging from 37 to 96 years) and the mortality rate was 25%. In February 1994, one year earlier, the average age was 66.5 years old (range: 32 to 91 years) and only one patient died (14%) among 7 pneumonia patients.

Asthma patients seemed to increase immediately after the catastrophe (Fig. 3). Unexpectedly, however, no asthma patient...
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Figure 4. Amount of the theophylline (upper) and aminophylline (bottom) prescribed for asthma patients.

was admitted during the next two months. It remains unresolved as to whether this absence was due to the decreased episodes of asthma attack or to the decrease in outpatient number. Thus we compared the monthly prescription between the two key drugs: i.e., theophylline tablets, which are basically used for all asthma patients; and aminophylline ampules, which are used exclusively for asthma attack. As shown in Fig. 4, the number of theophylline tablets prescribed was fairly constant every month in 1995 as well as in the past three years, probably reflecting that the total patient number remained unchanged after the earthquake. Also, the number of inhalant steroid prescriptions, another basic drug for the control of bronchial asthma, did not change (data not shown). In contrast, the ampules of aminophylline prescribed in 1995 decreased in number from January to April, showing a different pattern compared to the average doses prescribed in the previous three years where the number rather had peaked in April. This suggests that the absence of the admission of bronchial asthma patients following the earthquake was due to the decrease of asthma attack episodes in each patient.

Peptic ulcer

On February 1, 1995, endoscopic examination became possible in our institute. Until then, in the 2 weeks following the earthquake, we had seen no typical cases complicated with gastrointestinal bleeding from stress ulcer. Subsequently, in February, the number of patients endoscopically diagnosed as having peptic ulcer increased to about 4-fold that of the previous year (Fig. 5). The increase gradually resolved from February to April in 1995. In contrast, patients with duodenal ulcer rather decreased after the earthquake, and only one patient with acute gastric mucosal lesion (AGML) was disclosed during the

Figure 5. Comparison of the peptic ulcer patients diagnosed by endoscopy in 1994 and in 1995.
same period. Endoscopically, these gastric ulcers were chronic type ulcers.

Figure 6 shows the number of cases of gastric ulcer categorized according to size. On February 1995, the number of giant gastric ulcers, of greater than 2 cm in diameter by definition, far exceeded those of smaller sizes. In the subsequent month, too, the majority of gastric ulcer patients had a large ulcer.

Figure 7 shows the apparent increase in the number of bleeding episodes just after the earthquake in February 1995; of 9 patients who were complicated with bleeding, 4 needed transfusion of more than 1,000 ml, and all 9 suffered from gastric ulcer. One case died of bleeding, another case endoscopically underwent clipping of bleeding point, and the other 7 improved after conservative management. Examinations for Helicobacter pylori were not performed in these patients.

Diabetes mellitus

We estimated the status of diabetes control in patients whose HbA1c data were available before and after the earthquake. Data were collected during the preceding 6 weeks, and the succeeding 10 weeks, respectively. Figure 8 shows the changes between the HbA1c levels of both periods among patient groups divided into three categories: insulin therapy, anti-diabetic drugs, and diet only. The HbA1c of 144 diabetic...
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Discussion

Victims of the Hanshin-Awaji earthquake encountered physical, psychological, and economical stress. Furthermore, many had an insufficient gas, water and food supply under conditions of cold winter temperatures in damaged houses or temporary refuge. Under such unfavorable circumstances, respiratory infections may reasonably increase, particularly in aged individuals, during an early phase after the disaster. Pneumonia in the elderly may lead to a fatal outcome.

It was our initial impression that asthma attack might also increase in association with infection and anxiety reaction, but the assumption proved untrue. While previous reports (3, 4) described a high level of anxiety among asthmatics, a recent study during the Gulf War (5) showed that the level of anxiety in the asthmatic and comparison groups remained constant. The threshold may be different among individuals as to whether large anxiety induces asthma attacks or not. No report has described an apparent decrease in asthma attacks after disastrous conditions, but the present report suggests that stressful events may act as a suppressive factor on asthma attacks.

Characteristically, stress-associated gastric ulceration appears as acute erosive lesions or ulcers of “trench” shape with well-circumscribed margins and without inflammation (6, 7). Physical stress in the form of trauma, hemorrhagic or septic shock, burns, head injury, multiple organ failure, is thought to play a major role in the occurrence of ulcer (7). There has been no evidence, however, that a psychologic factor can induce ulcers (7). In a study on the stress ulcers following the Vietnam War (8), histological findings were distinct between acute ulcers and chronic ulcers. Chronic inflammatory cells, granulation tissue, and epithelial repair were found in chronic ulcers. These inflammation-and-repair reactions may suggest that the mucosal damage continued for a prolonged period (8). As shown in the present report, it was not until February 1, 1995, that patients with gastric ulcer increased in number. Although the possibility that we overlooked such severely complicated patients during the first two weeks is not disregarded, our clinical observation indicates that the sufferers of the earthquake, after some weeks of persistent stress, developed giant chronic-type ulceration.

War stress can affect glucose control as well. The level of HbA1c of 66 non-insulin-dependent diabetes mellitus patients increased from 10.1% to 10.9% during the Gulf war (9). Two studies (10, 11), however, showed that no significant difference was found between the diabetic patients who were forced to leave their home and the patients those who stayed. Psychological reaction could increase the serum cortisol level (10) but the authors discussed that it was not sufficient to make glycemic control less satisfactory (10). While forced with an inappropriate diet for a period, the present cases found no difficulty in obtaining proper medication for diabetes mellitus after the earthquake, because our hospital was not severely damaged. Probably, worse diabetic control resulted simply from inadequate food intake in these cases.

We encountered few cardiovascular diseases after the Hanshin-Awaji earthquake, but the same event was reported to cause an increase in the number of cardiovascular and sudden deaths during the first 6 weeks (1, 2). Such a difference may simply reflect the characteristics of the patients under the care of individual hospitals, or the limited capacity of our hospital might have precluded such patients with emergent condition immediately after the earthquake.

In this report, we have shown that the impact of the earthquake affected many patients in various ways. Following the initial rush of victims with surgical and orthopedic problems, patients with respiratory diseases increased, particularly in the elderly, within one month. Then, the persisting mental and emotional distress of a longer duration may have caused giant gastric ulcer as a stress-associated disorder in some individuals. On the other hand, chronic diseases such as diabetes mellitus could be affected after a lengthy duration of unfavorable environment. We must be aware that not only physical but also psychological care is necessary to manage severely affected persons after large-scale disaster. Further, it is helpful to know that each problem occurs at a different stage under such circumstances.

References