An Asthma Patient with Steroid-resistant Decrease in Peak Expiratory Flow after the Great East Japan Earthquake Showing Spontaneous Recovery after 1 Month

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Abstract

People living in Japan were affected in various ways after the Great East Japan earthquake of March 11, 2011. A 52-year-old female asthma patient not directly affected by the disaster experienced a decrease in peak expiratory flow (PEF) immediately after the earthquake. Despite increasing the inhaled and oral corticosteroid doses, her PEF did not recover. One month later, her PEF level abruptly returned to normal with minimal medications, which were previously ineffective, and the asthma-related symptoms vanished. The stabilization of her state of mind and actual social state seemed to be a part of the reason for the patient’s recovery.

Key words: asthma, stress, disaster medical care, psychosomatic medicine, respiratory medicine

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Introduction

On March 11, 2011, the Great East Japan earthquake hit northeast Japan. A subsequent tsunami and a nuclear accident further devastated the region. Nearly 20,000 people died or are missing due to the disaster, which affected not only the immediate victims of the earthquake and tsunami, but also people living throughout Japan in many ways. Some of the most potent effects of the disaster may be due to psychological stress, which may have affected people’s health statuses.

Natural disasters often cause massive societal devastation and destruction. For example, the 2004 Indian Ocean earthquake and subsequent tsunami devastated many countries around the Indian Ocean and left a major negative impact on the health of the survivors (1). Another example of such a catastrophic disaster is Hurricane Katrina; the storm hit the Gulf Coast of the USA in 2005 and was responsible for more than 1,800 deaths. Its negative impact on chronic diseases, including diabetes, has been reported (2). An increased incidence of acute myocardial infarction (AMI) over the 3-year period following the storm was also reported (3). Chronic stress following the disaster may be an explanation for the increase in AMI incidence. An additional example of a devastating disaster in Japan’s recent history is the Great Hanshin earthquake of January 1995, which killed more than 6,000 people in western Japan. An increase in hospital visits for pneumonia, asthma, peptic ulcers, and diabetes were reported following this incident (4). Additional examples of devastating disasters include the attacks of September 11, 2001 in New York, Virginia, and Pennsylvania. These attacks and subsequent rescue and recovery attempts also brought about various health problems and consequences to the USA, including the manifestation of mental health problems such as post-traumatic stress disorder or physical health problems such as respiratory diseases, gastro-esophageal symptoms, and cardiac complications (5, 6). American residents living far from the aforementioned sites also presented with numerous stress symptoms, including the development of sleep disorders, difficulties in concentrating, and disturbing thoughts and/or memories related to the event (7).

Although asthma is recognized as a somatic respiratory
ter this devastating disaster is important for future patient care. The knowledge and further understanding of such a case with a detailed clinical course accompanying disease worsening. The knowledge and further understanding of such a case with a detailed clinical course accompanied by PEF measurements obtained before, during, and after this devastating disaster is important for future patient care in the aftermath of disasters.

Case Report

The present report describes the case of a 52-year-old female asthma patient who experienced a decrease in PEF after the Great East Japan earthquake. Although she was not a direct victim of this disaster, the emotional, psychological, and physical stress of the disaster was considered to be the cause of the disease worsening. The knowledge and further understanding of such a case with a detailed clinical course accompanied by PEF measurements obtained before, during, and after this devastating disaster is important for future patient care in the aftermath of disasters.

Figure 1. Peak expiratory flow monitoring. The peak expiratory flow (PEF) suddenly decreased on the day of the earthquake, and returned to normal 4 weeks later. The PEF did not respond to the treatment modification. Routine regimen: mometasone furoate, 100 μg twice a day; budesonide 160 μg plus formoterol 4.5 μg, 1 puff twice a day; triamcinolone, 2 mg twice a week; pranlukast, 230 mg twice a day; theophylline, 200 mg twice a day. ICS: inhaled corticosteroid.

Figure 1: This figure illustrates the peak expiratory flow monitoring over a period of 4 weeks. The peak expiratory flow (PEF) suddenly decreased on the day of the earthquake and returned to normal 4 weeks later. The patient had a routine regimen that included mometasone furoate, 100 μg twice a day; budesonide 160 μg plus formoterol 4.5 μg, 1 puff twice a day; triamcinolone, 2 mg twice a week; pranlukast, 230 mg twice a day; and theophylline, 200 mg twice a day. ICS: inhaled corticosteroid.
other than pharmacological effects was considered. If the re-
ter a routine visit to the clinic. The existence of factors 
tion. Her PEF returned to normal only after 1 month with 
a routine increase in medications indicated for such a condi-
tion. Her decreased PEF did not return to normal levels after 
the time of the year was not a likely cause of this decrease for 
asthma patient who experienced a decrease in PEF after the 
morning without further deterioration. At this point, the control of her asthma seemed to follow the 
PEF levels in the evening and took a steroid burst according 
to her action plan. This time, her PEF levels returned to nor-
Discussion

The present report illustrates a case of a 52-year-old asthma patient who experienced a decrease in PEF after the 
Great East Japan earthquake. The change of seasons at this 
time of the year was not a likely cause of this decrease for 
her. The decreased PEF did not return to normal levels after 
a routine increase in medications indicated for such a condi-
tion. Her PEF returned to normal only after 1 month with 
the minimal prescription of a transdermal bronchodilator af-
ter a routine visit to the clinic. The existence of factors 
other than pharmacological effects was considered. If the re-
covered was due to the added bronchodilator, budesonide/form-
meterol that was doubled upon the PEF decrease should 
also have been effective to some extent. Further, because her 
PEF recovered simultaneously with the first application of 
the patch, the drug could not have been absorbed enough 
into the body at the time of recovery.

According to her asthma diary, she was able to sleep well 
after her clinic visit one month after the earthquake. This 
may be due to improvements in her psychological security, 
which may have, in turn, increased her strength reserve. Ad-
ditionally, the alleviation of anxiety may have had a benefi-
cial effect on PEF if the decrease in PEF had been due to 
psychological stress. In fact, worsening of asthma due to 
psychological distress has been reported to cause resistance 
to glucocorticoids (16), as was presumed for this patient. 
Part of this resistance may be explained by the central neu-
ral circuitry responsible for the interaction between emotion 
and exacerbation of asthma (17); this circuitry is thought to 
be different from the inflammatory immune system.

During or after catastrophic events, in patients influenced 
by disasters, the control of chronic diseases, such as hyper-
tension or diabetes, worsens for a relatively long pe-
period (3, 5, 18). For instance, an increase in AMI incidence 
was reported after the Great Hanshin earthquake (19). 
Suzuki et al. attributed this increase to severe emotional 
stress due to a chaotic environment (20). There seems to be 
wide agreement that psychosomatic effects play an impor-
tant role after such catastrophes.

After the Great East Japan earthquake, exacerbation of 
dementia was also reported in victims (21), and the neces-
sity of psychological care for these patients has been previ-
ously discussed (22). Similarly, although they did not pro-
cede with a clear explanation for their findings, Satoh et al. re-
ported that the self-measured home blood pressure levels of 
victims were elevated immediately after the earthquake (23).

Interestingly, the home blood pressure elevation men-
tioned above also self-resolved after a month (23), similar to 
our patient’s PEF recovery. Thus, the duration of changes in 
blood pressure coincides with the decrease in PEF in the 
present case. Although this similarity may be coincidental, 
we investigated further and surveyed social factors that may 
be involved in this “1 month effect” or phenomenon. Fig-
ure 2 shows the number of earthquakes that were monitored 
in Tokyo between February and May 2011. Subsequent 
earthquakes or aftershocks occurred frequently immediately 
after the main earthquake; however, the number decreased 
progressively with the exception of the largest after-quake, 
which struck on April 11. Since after-quakes were tragic re-
minders of the catastrophic disaster for the surviving victims 
as well as for non-affected residents, the decrease in after-
quakes may have alleviated the fear and symptoms associ-
ated with this distress.

Figure 3 shows the average amount of television airtime 
that earthquake coverage received; this may explain the tran-
sition of social situations after a catastrophic earthquake 
from a different perspective. Immediately after the earth-
quake, virtually all television stations switched to special 
coverage of the disaster. However, after 1 month, the pro-
portion of disaster coverage began to decline. A reduction in 
the disaster coverage may have diverted people’s attention 
from the tragedy, thus reducing stress-related symptoms.

One or both of the aforementioned observations may ex-
plain, at least in part, the PEF changes that occurred during 
the stressful settings experienced by our asthma patient. 
These factors may have been responsible for the negative 
change in clinical parameters, including PEF. Interestingly, 
Takakura et al. (4) reported an immediate and temporal in-
crease in patient visits for asthma after the Great Hanshin 
earthquake after 1 month, suggesting that changes in asth-
matic status after a disastrous stress may often last for 1 
month or more in the disaster-affected area, although no 
particular explanation was provided for this finding. Even if
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