<table>
<thead>
<tr>
<th>Table</th>
<th>Changes in the condition of psychiatric inpatients after the complex Fukushima disaster</th>
</tr>
</thead>
</table>

**Title**
Changes in the condition of psychiatric inpatients after the complex Fukushima disaster

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CHANGES IN THE CONDITION OF PSYCHIATRIC INPATIENTS AFTER THE COMPLEX FUKUSHIMA DISASTER

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Abstract: After the high magnitude earthquake and the subsequent tsunami in Japan on March 11, 2011, the residents of Fukushima Prefecture suffered not only from tremendous physical injury caused by the earthquake and tsunami but also from the effects of radiation contamination after a hydrogen explosion at the Fukushima Daiichi nuclear power plant on March 12, 2011. The complex Fukushima disaster is characterized by additional stress due to the fear of continued exposure to invisible radiation. We investigated whether there were any changes in the clinical mental state of patients in the inpatient ward of Fukushima Medical University Hospital, Japan, 7 days after the earthquake. There was no obvious change in the condition of two-thirds of the patients. Whereas one-third of patients had any change in their condition, several cases showed dramatic symptomatic improvement after the earthquake. Anxiety levels in the patients who originally showed coexisting anxiety disorders became exaggerated. The depressive state was improved after the earthquake in one patient with depression. One patient with restrictive-type anorexia nervosa resumed food consumption. These findings suggest that caregivers should be attentive to any symptomatic changes among patients with psychiatric disorders after sudden disasters.

Key words: Fukushima nuclear disaster, radiation contamination, earthquake, psychiatric symptoms, anxiety

INTRODUCTION

Our institution, Fukushima Medical University Hospital, is the central hospital in Fukushima Prefecture. The hospital is located in the prefectural capital, Fukushima city, approximately 50 km from the Fukushima Daiichi nuclear power plant. Our hospital has 30 clinical departments and 778 beds, including 49 psychiatric beds. After the high magnitude earthquake and the subsequent tsunami in Japan on March 11, 2011, the residents of Fukushima Prefecture suffered not only from tremendous physical injury caused by the earthquake and tsunami but also from the effects of radiation contamination after a hydrogen explosion at the Fukushima Daiichi nuclear power plant on March 12, 2011. Kario et al. has previously reported an increase in “white coat” hypertension in response to stress due to the Hanshin-Awaji earthquake that occurred in 1995. However, compared to the Hanshin-Awaji earthquake, the complex Fukushima disaster is characterized by additional stress due to the fear of continued exposure to invisible radiation.

Apart from the atomic bombings of Hiroshima and Nagasaki, the only major accidents in the past wherein human residential areas were exposed to radiation were the Three Mile Island accident in the United States and the Chernobyl nuclear power plant disaster in the former Soviet Union. To the best of our knowledge, no reports regarding comparative changes in the condition of patients with psychiatric disorders before and after radiation exposure in these two major accidents have been published. Although post-traumatic stress disorder has received considerable attention as the most prevalent psychiatric problem after a disaster, the
dynamic states of patients with other types of psychiatric disorders who are facing disasters need to be studied.

Therefore, in this paper, we report the changes observed among inpatients in our psychiatric ward after the complex Fukushima disaster that included a nuclear power plant accident. We aimed to determine the various issues that should be considered in patients with psychiatric disorders after any sudden disaster.

MATERIALS AND METHODS

We obtained approval for this study from the ethics committee of Fukushima Medical University (approval No. 1313). We investigated whether there were any changes in the clinical mental state of patients in the inpatient ward of Fukushima Medical University Hospital 7 days after the earthquake. We obtained these data from patients’ case records.

RESULTS

Table 1 shows the age, sex, and diagnosis of the patients in our inpatient ward on the day of the earthquake as well as the changes in the patients’ clinical states 7 days after the earthquake. The time period of 7 days was selected because it is thought to be the period during which acute reactions to serious events occur.\(^5\) During the survey period, the dosages and types of psychotropic drugs administered to the patients remained basically unchanged. However, psychotherapy or psychosocial therapy could not be administered due to the

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Changes before and after earthquake</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
<td>F</td>
<td>Schizophrenia</td>
<td>No change</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>F</td>
<td>Schizophrenia</td>
<td>No change</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>F</td>
<td>Schizophrenia</td>
<td>No change</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>M</td>
<td>Schizophrenia</td>
<td>No change</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>M</td>
<td>Schizophrenia</td>
<td>Slight improvement</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>F</td>
<td>Schizophrenia</td>
<td>No change</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>M</td>
<td>Bipolar Disorder (manic state)</td>
<td>No change</td>
</tr>
<tr>
<td>8</td>
<td>69</td>
<td>M</td>
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<td>No change</td>
</tr>
<tr>
<td>9</td>
<td>75</td>
<td>F</td>
<td>Depression, Anxiety Disorder</td>
<td>Increased anxiety</td>
</tr>
<tr>
<td>10</td>
<td>53</td>
<td>M</td>
<td>Depression, Anxiety Disorder</td>
<td>Increased anxiety</td>
</tr>
<tr>
<td>11</td>
<td>49</td>
<td>F</td>
<td>Depression</td>
<td>No change</td>
</tr>
<tr>
<td>12</td>
<td>54</td>
<td>M</td>
<td>Depression</td>
<td>Increased volition, tended to improve</td>
</tr>
<tr>
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<td>50</td>
<td>M</td>
<td>Depression</td>
<td>No change</td>
</tr>
<tr>
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<td>20</td>
<td>M</td>
<td>Depression</td>
<td>No change</td>
</tr>
<tr>
<td>15</td>
<td>61</td>
<td>M</td>
<td>Alzheimer-Type Dementia</td>
<td>No change</td>
</tr>
<tr>
<td>16</td>
<td>80</td>
<td>M</td>
<td>Alzheimer-Type Dementia</td>
<td>No change</td>
</tr>
<tr>
<td>17</td>
<td>54</td>
<td>F</td>
<td>Parkinson Disease</td>
<td>Increased anxiety</td>
</tr>
<tr>
<td>18</td>
<td>61</td>
<td>M</td>
<td>Parkinson Disease</td>
<td>No change</td>
</tr>
<tr>
<td>19</td>
<td>50</td>
<td>F</td>
<td>Anorexia Nervosa</td>
<td>No change</td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>F</td>
<td>Anorexia Nervosa</td>
<td>Marked improvement</td>
</tr>
<tr>
<td>21</td>
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<td>F</td>
<td>Anorexia Nervosa, Avoidant Personality Disorder</td>
<td>Increased anxiety</td>
</tr>
<tr>
<td>22</td>
<td>18</td>
<td>M</td>
<td>Asperger’s Disorder</td>
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<td>23</td>
<td>28</td>
<td>M</td>
<td>Pervasive Developmental Disorder</td>
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<tr>
<td>24</td>
<td>15</td>
<td>M</td>
<td>Asperger’s Disorder</td>
<td>Worsening irritability</td>
</tr>
<tr>
<td>25</td>
<td>13</td>
<td>M</td>
<td>Vocal Tic Disorder</td>
<td>No change</td>
</tr>
<tr>
<td>26</td>
<td>35</td>
<td>F</td>
<td>Adjustment Disorder (Depressive state)</td>
<td>No change</td>
</tr>
<tr>
<td>27</td>
<td>37</td>
<td>F</td>
<td>Alcoholism, Borderline Personality Disorder</td>
<td>Increased anxiety</td>
</tr>
<tr>
<td>28</td>
<td>58</td>
<td>F</td>
<td>Mental Retardation</td>
<td>No change</td>
</tr>
</tbody>
</table>
emergency conditions prevailing at that time.

There was no obvious change in the condition of
two-thirds of the patients. Whereas one-third of
the patients had any change in condition, several
cases showed dramatic symptomatic improvement
after the earthquake. However, several issues
were noteworthy, particularly in patients with
depression and those with primary or coexisting
anxiety disorders.

No remarkable changes were observed in the
conditions of patients with schizophrenia (Cases
1-6) or dementia (Cases 15 and 16). Among the
patients with developmental disorders, one patient
(Case 24) who originally showed a high level of anxi-
ety showed an increase in irritability. Among the
patients with depression (Cases 9-14), those with
coexisting anxiety disorders (Cases 9 and 10)
showed an increase in anxiety levels. However,
in the case of one patient with depression (Case 12),
the patient’s volition increased and he could control
his thoughts without feeling hopeless and help-
less. With regard to the patients with anorexia nervosa, one patient with restrictive-type anorexia
nervosa (Case 20) showed a dramatic change, i.e.,
the patient resumed normal food consumption just
after the earthquake. In contrast, in another patient
with anorexia nervosa and a coexisting avoidant person-
ality disorder (Case 21) who originally demon-
strated severe anxiety, the anxiety levels intensified
with increased overeating and vomiting and the
patient’s overall condition deteriorated.

In Case 20, the patient had a history of adjust-
ment difficulties at school at 13 years of age, along
with refusal to eat food, which led to her admission
to our inpatient ward 26 days before the earth-
quake. On admission, her food intake was approxi-
mately 10-40% of the hospital meals served. She
spoke few words and was thought to be alexithy-
ic. However, starting on the day after the earth-
quake, she began to eat almost the entire meal and
the flow of conversation with other people became
smoother. In addition, she had pancytopenia on
admission; however, this also improved by Day 17
after the earthquake. Interview records from 3
days after the earthquake revealed that the critical
and chaotic situation — including the earthquake
and the preventive use of iodine tablets against pos-
sible radiation contamination from the nuclear power
plant accident — altered her prior defense mecha-
nisms and internal conflicts, leading to self-realiza-
tion of the meaning of life and the implications of
improving her behavior and symptoms.

DISCUSSION

The changes in the psychiatric conditions
before and after the complex Fukushima disaster of
patients who were hospitalized on the day of the
earthquake can be summarized as follows:

1. There was no obvious change in the condi-
tion of two-thirds of the patients.
2. Anxiety levels in the patients who originally
showed coexisting anxiety disorders became exag-
gerated.
3. The depressive state was improved after
the earthquake in one patient with depression.
4. One patient with restrictive-type anorexia
nervosa resumed food consumption immediately
after the earthquake, with dramatic symptomatic
improvements.

When the nuclear power plant accident
occurred after the earthquake on March 11, 2011,
people experienced fear of invisible radiation,
because adequate information regarding how to deal
with the situation was not available as a result of the
sudden and unexpected nature of the disaster. In
addition, it was impossible to predict when the situa-
tion would improve. Evacuation to locations away
from the disaster area within a short time period
was difficult for many people. Thus, many people
experienced continuous fear of exposure to invisible
radiation, which induced severe stress, particularly
among patients with psychiatric disorders.

Therefore, even in patients who have been sta-
ble for many years, careful attention must be paid to
any sign of worsening in the condition. If there is
even a slight sign of worsening, a prompt increase in
the doses of mood-stabilizing drugs, adequate psy-
chotherapy, and increased social support on the basis
of patients’ consent should be considered.

In conclusion, we have reported here a brief
summary of the effects of the complex Fukushima
disaster on patients with psychiatric disorders.
Increased anxiety levels in patients with primary or
coexisting anxiety disorders were noted. In addi-
tion, the disaster triggered improvement in some
patients with depression and anorexia nervosa.
These findings suggest that caregivers should be
mindful of slight symptomatic changes among
patients with psychiatric disorders after sudden
disasters.

ACKNOWLEDGMENTS

This report is a reflection of our clinical activi-
ties during the tense early days after the complex
Fukushima disaster, which could have been written by any of our colleagues. Thus, the authors wish to express their sincere thanks to all of their colleagues whose devotion, professionalism, and dedication were essential in the battlefield-like conditions in the ward, but who are not listed as the authors of this manuscript.

REFERENCES


