

Effects of the Tohoku Earthquake (The Great East Japan Earthquake) on Various Cutaneous Conditions

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ABSTRACT

Due to the Tohoku disaster, people living in Fukushima were confronted with many problems. They were not injured by the Tsunami, but were severely affected both environmentally and mentally. Patients who had been followed up at our dermatology department had to face such issues as rapid changes in lifestyle, shortage of daily necessities such as medications and baths, as well as an anxiety over the effects of radiation. Fukushima Medical University Hospital closed its outpatient clinic for nearly two weeks following the disaster. When we re-opened our clinic, we conducted a questionnaire analysis subjected 973 patients who visited our out-patient clinic, by asking patients of their skin conditions and how they coped with skin disorders. At first, we supposed that various skin conditions were exacerbated by different circumstances caused by the disaster; however, overall, exacerbation of skin conditions was not as severe as was anticipated. We herein describe the status of cutaneous conditions in those early days.

Keywords: Tohoku earthquake, Great East Japan Earthquake, Skin condition, Stress.

INTRODUCTION

On March 11th 2011, a big earthquake (magnitude 9.0) struck the Tohoku region of Japan, which was then devastated by a subsequent giant tsunami. These disasters led to further catastrophe in the form of the 'Fukushima disaster', or the nuclear power plant accident, which created more problems for Tohoku residents, especially for those living in the eastern coastal areas of Fukushima Prefecture. A number of studies related to the effects of Tohoku disasters on various disorders have been carried out; however, there are very few reports on the influences of the disaster on cutaneous conditions. We examined whether the Tohoku disaster affected various cutaneous conditions.

METHODS

Immediately following the 2011 Tohoku Earthquake (The Great East Japan Earthquake), Fukushima Medical University Hospital closed its outpatient clinics, for all non-emergency cases. We re-opened the clinics on March 26th 2011, two weeks after the disaster. After obtaining the approval of our Institutional Review Board, we carried out a

questionnaire analysis of the effect of the disaster on cutaneous conditions, objecting to the outpatients who visited the Department of Dermatology of Fukushima Medical University Hospital until the end of June in 2011. The questionnaire consisted of questions, mainly asking about skin conditions such as the following: "How is your skin condition?" "What is the most serious trouble?" "If your skin condition has worsened, what do you think the exacerbating factors were?" "How many folds did your skin condition worsen?" and "How have you been treated while our hospital was closed?"

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RESULTS

The total number of patients was 973, consisting of 436 males and 425 females (112 were unknown). The mean age was 53.2 years old, ranging from 0 to 94 years old. Regarding the patients' skin disorders, we evaluated atopic dermatitis (n=63), eczema (n=195), psoriasis (n=66), alopecia (n=27), collagen disease (n=53), and infectious disease (n=74). Contrary to our initial expectations, the proportion of those who experienced exacerbation of skin diseases was remarkably low, and those with stable skin conditions were the most common. As is shown in **Figure 1**, worsening of condition was most frequently observed in atopic dermatitis (32%), followed by psoriasis (26%). Of the patients who had remained in their house (n=783) and those who had been living in the shelter (n=47), 17% and 28% complained of worsening of skin conditions, respectively. Moreover, despite self-evaluation, the worsening ratio of

patients living in the shelter (2.75-fold exacerbation) was higher than that of patients living in their house (1.92-fold exacerbation). An additional question regarding embarrassing factors was asked to the patients who were living in areas where water supply was suspended (n=475). Itching was the most commonly reported problem (43%) (**Figure 2a**). We next examined exacerbating factors (n=118). No bathing (24%, n=37) was the most commonly reported factor, followed by shortage of ointment (12%, n=18) or tablets (7%, n=10), stress (13%, n=20), and others (30%, n=45) (**Figure 2b**). "Others" included treatment interruption, fatigue, lifestyle changes, earthquakes, evacuation, ineffective drugs, and coldness. While our hospital was closed, 27% of the patients obtained drugs at other clinics, 23% purchased drugs at pharmacies, and 43% received no treatment.

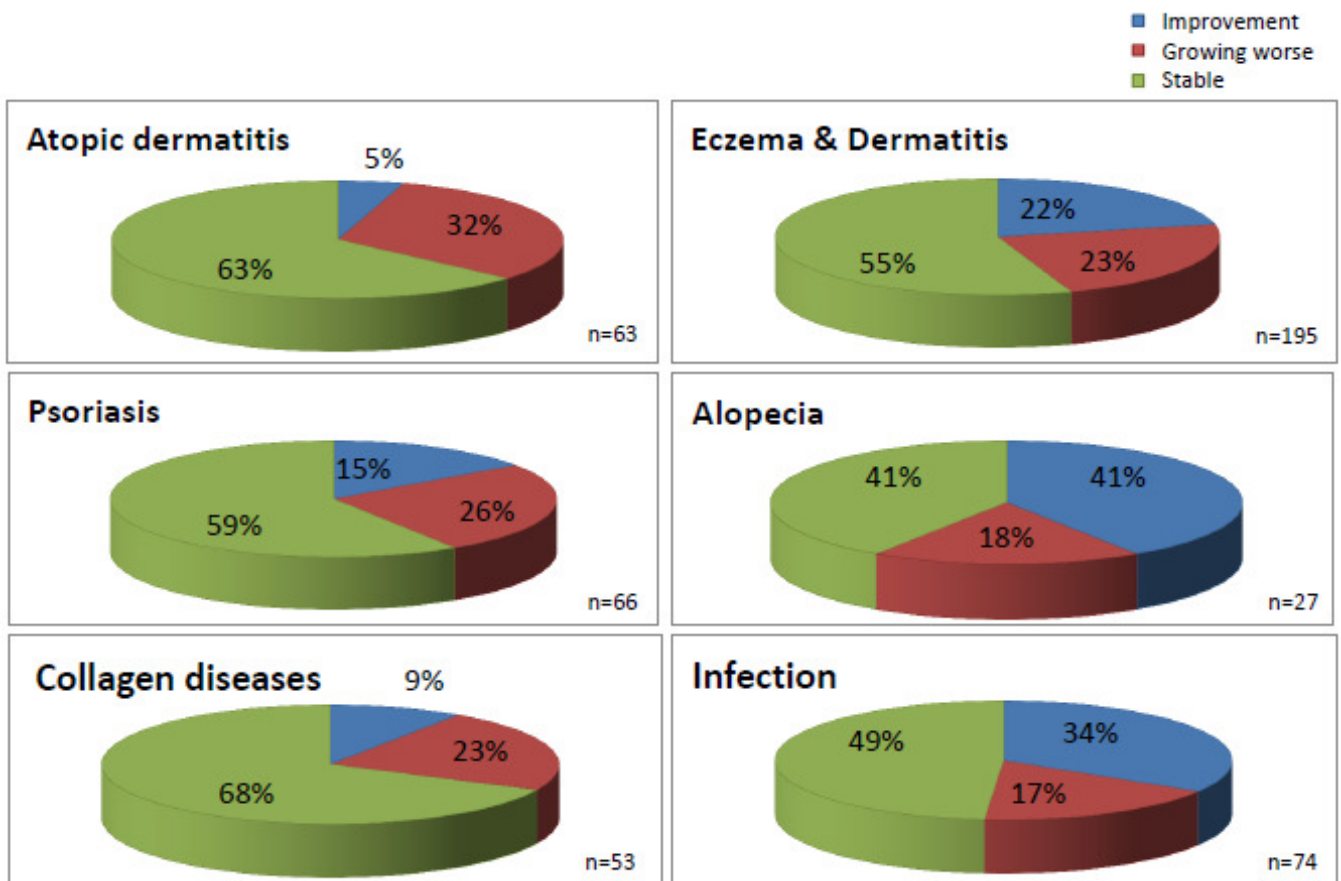
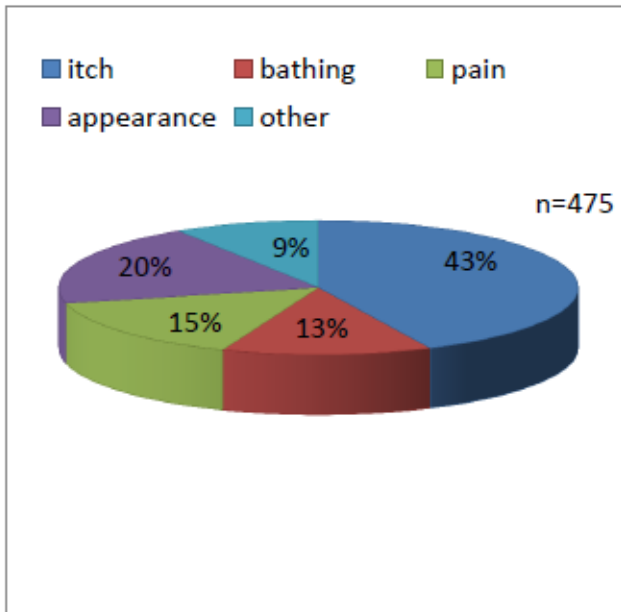
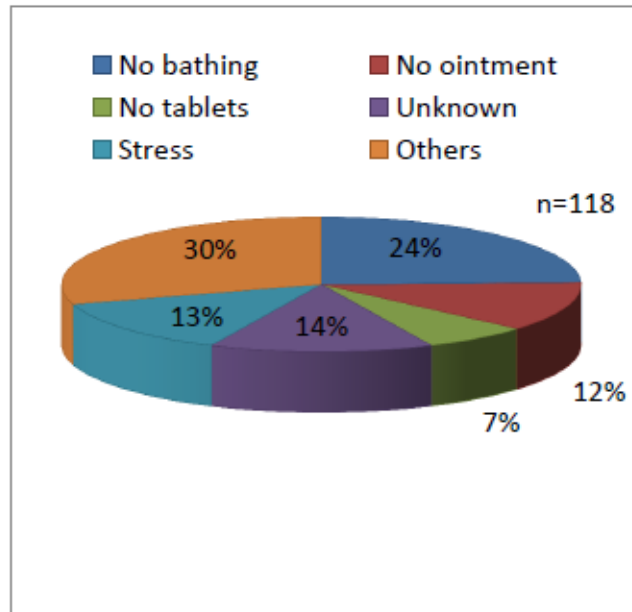


Figure 1. Results of the self-evaluation of cutaneous conditions of several representative diseases.

Figure 2a**Figure 2b****Figure 2a.** Answer to the question, “What is the most serious problem?”**Figure 2b.** Answer to the question, “What do you think the exacerbating factors were?”

DISCUSSION

Since the 2011 Tohoku disaster, various effects of the disasters on various conditions, such as infectious diseases (influenza, tuberculosis, pneumonia), cardiovascular diseases, diabetes, dialysis, gastrointestinal diseases, respiratory disease, asthma, deep vein thrombosis, as well as various aspects not directly related to radiation, have been reported [1]. By contrast, studies focusing on cutaneous conditions are very few [2, 3]. Murata et al. [2] reported that, during the treatment of victims of the tsunami in the evacuation centers by the emergency team, infections-infestations were found to be the most prevalent skin conditions, followed by traumatic skin disorders and eczema. By contrast, the subjects of our study are different, as they were not injured by the tsunami; and most of them remained in Fukushima. They had many problems, such as concern of radiation, rapid changes of lifestyle, shortage of daily necessities, and so on, which may affect skin conditions.

A number of studies have demonstrated that mental stress due to miserable disasters exerts a significant influence on various diseases. The residents of evacuation zones in Fukushima, due to the Tohoku disaster, showed severe psychological distress [4]. In dermatological field, several skin disorders, such as atopic dermatitis, urticarial, psoriasis, acne, alopecia, or herpes zoster, are known to be affected by

psychological stress. We herein reported the influences of the Tohoku disaster on various inflammatory skin disorders, by analyzing the answers to the questionnaire we obtained from the patients, during the three months immediately following the disaster. Our results showed that the number of patients who felt significant worsening of their skin conditions was much lower than we had anticipated. The reason may be that the lifelines were stopped for relatively short periods, *i.e.* at the most one week. Also, a limitation of this research was that the method was self-evaluation. Furthermore, we could not evaluate all patients who had been treated in our outpatient clinic as many had evacuated due to the disaster. Patients who had remained in Fukushima may have been much less stressed than those who evacuated from Fukushima, worrying about the influences of radioactivity especially on their small children. Nevertheless, atopic dermatitis and psoriasis were the frequent conditions showing exacerbation, both of which is affected by mental stress [5-7].

In previous studies on serious stress at the time of Hanshin Great Earthquake, subjective distress was the most responsible factor for exacerbating atopic dermatitis [8]. Other factors such as medication shortage, bathing stoppage, and dusty environment were also representative exacerbation causes [8]. Stress interacts with various immune mechanisms, *via* neuro-immune pathways, by acting on the central nervous system and then affecting the endocrine

system. The stress signals activate the central hypothalamic-pituitary-adrenal (HPA) axis to release stress hormones [9]. In addition, many hormones are also generated in the skin, and peripheral HPA axis (skin-HPA axis) is influenced by stress to release neurotransmitters [10]. Stress also attenuates HPA axis response, shifts to the Th2 immune response, and modulates the innate and adaptive cutaneous immune responses.

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