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Mental health and school-based intervention among adolescent exposed to the 2011 Great East Japan Earthquake and tsunami

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ABSTRACT

This study examined the symptoms of depression, anxiety, and post-traumatic stress disorder (PTSD) among 101 adolescents for 3 years after the 2011 Great East Japan Earthquake. The findings showed that 15.6%, 51.4%, and 18.7% of participants reported clinical symptoms of depression, anxiety, and PTSD 1 year after the earthquake. The effectiveness of a school-based intervention for high-risk students was examined for 3 years. Adolescents who received the intervention at 16 months after the earthquake in 2012 (19.8%), and who received the intervention at 28 months in 2013 (21.8%) showed improved anxiety symptoms. However, 37.6% students showed no intervention effect, despite undergoing the intervention twice. Overall, high school students with poor psychological test scores in their first year might require help from a specialized agency, such as a hospital with a pediatric psychiatry department.

1. Introduction

1.1. Children affected by earthquake

In general, children who experience a large-scale disaster encounter age-specific mental health problems, including separation anxiety or regression phenomena [1,2]. An initial report on children's psychological reactions after a large natural disaster was published after the 1980 Italian earthquake. By administering the Rutter Behavioral Questionnaire every month during a 1-year therapeutic intervention implemented 6 months after the earthquake, Galante and Foa [3] showed that anxiety and fear in schoolchildren were significantly improved. Since this publication, the emotional disturbance of children has garnered more attention, and the increased frequency and severity of depression, anxiety, and post-traumatic stress disorder (PTSD) among children affected by disasters have been widely recognized. For example, the prevalence of PTSD among children who were victims of earthquake trauma ranges from 2.5% to 92%, depending on the disaster and subject characteristics, assessment methods, and PTSD criteria [4,5]. Furthermore, the effects of post-disaster traumatic stress tend to persist for years with stable rates of elevated symptoms among affected children [6].

Although there are fewer investigations of the effect of traumatic events caused by tsunamis on children than investigations of the effects of earthquakes, previous studies have indicated that traumatic events caused by tsunamis are significantly associated with depressive symptoms and PTSD among children. Thienkrua et al. [7] found that 75% of 7- to 14-year-old children who changed their place of residence due to the 2004 Indian Ocean Tsunami showed evidence of PTSD. Usami et al. [8] and Iwadare [9] reported the effects of the Great East Japan Earthquake on children between the ages of 6 and 15 years. With increasing age, scores increased on the Post Traumatic Symptoms Scale 15, both 8 and 20 months after the earthquake. However, to the best our knowledge, the psychological effect of disaster on adolescents has not been investigated well, and no longitudinal studies have collected such data on adolescents.

1.2. Adolescents affected by natural disaster

In 1981, the United Nations (UN) defined a child as a person under the age of 14 and a youth as a person between 15 and 24 years of age. The UN also defined a child as a person under the age of 18 at the 1979 Convention on the Rights of the Child [10]. Mental health problems

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affect 10–20% of children and adolescents in general; such problems are the leading cause of health-related disability in this age group and have long-lasting effects throughout life [11]. Adolescence is a formative period of biological and social transition, which along with increasing executive functions and heightened social sensitivity, influence a number of adolescent behaviors [12]. Kessler et al. [13] reported that about half of all Americans would meet the criteria for a DSM-IV disorder sometime in their life, with the first onset usually occurring in childhood or adolescence. Therefore, interventions aimed at prevention or early treatment should focus on the young.

Although mental health problems negatively affect the young during adolescence and into adulthood, the transitional age from childhood to youth (i.e., between 15 and 18 years of age) has not been assessed in post-disaster mental health studies well. Fan et al. [14] first reported psychological symptoms and their correlates among a large sample of adolescents after a natural disaster, the 2008 Wenchuan earthquake. Their study showed that 15.8%, 40.5%, and 24.5% of participants reported clinical symptoms of PTSD, anxiety, and depression among 2250 adolescents 6 months after the 2008 Wenchuan earthquake in China. The longitudinal rates of PTSD in adolescents after the Wenchuan earthquake were 9.7%, 1.3%, and 1.6% at the 6-, 12- and 18-month follow-ups, respectively [15].

These findings have important implications for future research. Longitudinal and cohort research is needed for examining the long-term impacts of traumatic stress on adolescents' behavioral, cognitive, and emotional development.

1.3. Intervention for children and adolescent affected by natural disaster

Studies of the influence of psychological interventions for children in post-disaster settings are limited compared with studies that assess the psychological impact of disasters. In intervention studies, the variety of strategies used in individual cases has been widely discussed, including psychotherapeutic techniques [16] and vehicles for intervention [17]. By contrast, intervention strategies for the population-based management of children in post-disaster settings have rarely been investigated. Recently, the implementation of a specific school-based intervention called the School Therapeutic Enhancement Program (STEP) was introduced in a school district affected by Hurricane Katrina [18]. Berkowitz, Stover, and Marans [19] reported the effectiveness of the Child and Family Traumatic Stress Intervention (CFTSI). This is a four-session intervention administrated by a caregiver who is trained to prevent the development of chronic PTSD.

These types of interventions require considerable numbers of staff members and specialists as well as significant financial resources. Thus, this type of thorough intervention system cannot be applied to typical communities affected by disasters because labor and budgets tend to be smaller than necessary.

The Great East Japan Earthquake that occurred on March 11, 2011 was a large earthquake with a 9.0 magnitude on the Richter scale. The subsequent tsunami destroyed eastern coastal towns and villages in Japan [20]. This was one of the largest natural disasters in Japanese history, with more than 18,000 people reported dead or missing and more than 6000 people injured [21]. The catastrophic earthquake caused long-lasting depression and PTSD among people in the affected areas. In the aftermath of the Great East Japan Earthquake, we researched the application of a school-based intervention system.

The primary purpose of this study was to report the prevalence and severity of depression, anxiety, and PTSD among adolescents for a period of 3 years after the Great East Japan Earthquake, based on longitudinal, cohort research. Specifically, this study aimed to (a) examine the symptoms of depression, anxiety, and PTSD among high school students by a longitudinal method; and to (b) examine the use of a school-based intervention in high school students who were at high risk of a poor psychological state after the Great East Japan Earthquake. Interventions were performed by integrating standard local resources, such as the home-room teachers, school nurses, and school counselors.

2. Study

2.1. Participants and procedures

High-school students who were in first-grade in 2012, aged 15–16 years, whose high school was located on the ocean side of the Miyagi prefecture, participated in three annual mental health surveys, followed by psychological interventions [22,23].

The high school, referred to as High School A in this manuscript, was located less than 1 km from the seashore. High School A was hit by the tsunami on the afternoon of Friday, March 11, 2011, and all educational facilities and school equipment were destroyed. Classes resumed on May 9, 2011. The students and school staff were divided into three groups and relocated to spaces in three other high schools in the region. A total of 240 students across six classes commuted on a 1.5-h bus ride to temporary classroom facilities 60 km from the destroyed high school. The 3-h round trip included a regular curriculum consisting of 50-min educational programs that utilized audiovisual materials aimed at minimizing motion sickness. The remaining students utilized public transportation to commute independently to two other distant classroom facilities located 26 km and 20 km from their original high school. These conditions lasted until prefabricated classrooms were completed in an assigned location 10 km inland from the original school on September 1, 2011.

The majority of the participating students, who experienced the earthquake in the Miyagi prefecture, with a seismic intensity of approximately 6, shared disaster-related experiences directly and indirectly with members of the community and repeatedly witnessed the devastated area regardless of their assigned high school or grade level. The first-year students who participated in the 2012 experienced the disaster around their junior high school graduation date.

2.2. Recruitment of participants

The ethics committees of the Miyagi Prefecture Psychiatric Care Center and Hokkaido University approved the research protocols. After explaining the purpose and protocol of the investigation to the high school, with the cooperation of the Miyagi-ken School Board, we obtained consent for the investigation. We sent an information brochure explaining the study and asking for cooperation, as well as the questionnaire, to the high school. We commissioned teachers to distribute these to the students and their parents. Only students who provided consent were indicated by the school in the questionnaire, and more information about these students was obtained. Students' privacy and human rights were respected, as explained the students and their parents. 1) To ensure privacy, they indicated only the school registration number on the questionnaire, and we maintained the privacy of the information throughout. 2) Students could decide to participate in our investigation based on their own free will and with their parents' permission. 3) Students that did not want to participate, were not required to entre submit information. 4) If they did not participate, they were not disadvantaged in any way. 5) The findings from this investigation were only to be used for presentation via academic meetings and scientific journals, and for no other purpose.

After obtaining informed consent, we asked the high school students to submit their questionnaires; submission was considered to indicate consent to use the data submitted. Furthermore, students were asked to write only the school registration number on the questionnaire. Specification by means of the school registration number done was done by the school teachers only, and was used for school-based intervention. Thus, survey information obtained via the school registration number was anonymized for analysis.

The Hokkaido University Graduate School Preservation of Health Scientific Research Center converted information collected from the school via questionnaires into electronic format, in order to avoid identifying himself or herself by handwriting. Data analysis and