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Study Profile

Design of the health examination survey on early childhood physical growth in the Great East Japan Earthquake affected areas



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ABSTRACT

Background: To investigate the impact of the Great East Japan Earthquake on preschool children's physical growth in the disaster-affected areas, the three medical universities in Iwate, Miyagi, and Fukushima Prefectures conducted a health examination survey on early childhood physical growth.

Methods: The survey was conducted over a 3-year period to acquire data on children who were born in different years. Our targets were as follows: 1) children who were born between March 1, 2007 and August 31, 2007 and experienced the disaster at 43–48 months of age, 2) children who were born between March 1, 2009 and August 31, 2009 and experienced the disaster at 19–24 months of age, and 3) children who were born between June 1, 2010 and April 30, 2011 and were under 10 months of age or not born yet when the disaster occurred. We collected their health examination data from local governments in Iwate, Miyagi, and Fukushima Prefectures. We also collected data from Aomori, Akita, and Yamagata Prefectures to use as a control group. The survey items included birth information, anthropometric measurements, and methods of nutrition during infancy.

Results: Eighty municipalities from Iwate, Miyagi, and Fukushima Prefectures and 21 from the control prefectures participated in the survey. As a result, we established three retrospective cohorts consisting of 13,886, 15,474, and 32,202 preschool children.

Conclusions: The large datasets acquired for the present survey will provide valuable epidemiological evidence that should shed light on preschool children's physical growth in relation to the disaster.

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1. Introduction

The Pacific coastal areas of Iwate, Miyagi, and Fukushima Prefectures were substantially damaged as a result of the Great East Japan Earthquake on March 11, 2011. The damage to human life and property from the massive 9.0 magnitude earthquake and subsequent giant tsunami were unprecedented in modern Japanese history.^{1–4} While there is great concern regarding the possible

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health impact among people who experienced the disaster, there is limited knowledge about how the occurrence of an enormous natural disaster in a developed country affects people's health.^{5,6} In particular, we are concerned about the health of preschool children who experienced the catastrophe during the most vulnerable period of their physical and mental development.^{7–9} Several factors, such as environmental changes to child care and post-disaster traumatic stress, might affect their health.^{10,11}

One year after the disaster, the Department of Pediatrics at the three medical universities in Iwate, Miyagi, and Fukushima Prefectures collaboratively initiated two surveys: the nationwide nursery school survey on child health throughout the Great East Japan Earthquake-affected areas¹² and the present health examination survey on early childhood physical growth in the Great East Japan Earthquake-affected areas. Using data from these surveys, we aim to provide comprehensive epidemiological evidence of the impact of the disaster on preschool children's health.

In our nationwide survey, we targeted nursery school children who experienced the disaster during their preschool days and compared them to children who did not experience the disaster using data collected from all 47 prefectures in Japan. In addition to longitudinal data on physical measurements, we obtained data on the presence of diseases, history of moving in and moving out, and personal experience with the disaster.

In the present survey, we intend to validate the results of the former survey. Furthermore, the present survey will allow us to examine how physical growth differs depending on the age at the time of experiencing the disaster among preschool children in the most affected areas. The present survey also includes information that was not examined in the former survey, including gestational age of newborns, methods of nutrition during infancy, and head circumference. Here, we describe the design of the present survey and the results of data collection.

2. Methods

2.1. Survey design and population

We accessed 3-year-old health examination records, which allowed us to retrospectively acquire children's anthropometric measurements during early childhood. In accordance with the Maternal and Child Health Act in Japan,¹³ regular health examinations during early childhood are provided at least two times at the municipal level: 1) over the age of 18 months and below the age of 2 years (referred to as the 1-and-a-half-year-old health examination) and 2) over the age of 3 years and below the age of 4 years (referred to as the 3-year-old health examination). The timing of regular health examinations, including additional health examinations during infancy, varies by municipality.

We invited all 127 municipal governments in Iwate, Miyagi, and Fukushima Prefectures, which were most affected by the disaster, to participate in the survey. Iwate Medical University, Tohoku University, and Fukushima Medical University sent a letter of invitation, including an overview of the survey and a sample of the survey sheet to the municipal governments in each prefecture. If the municipal governments agreed to participate in the survey, they provided data by one of the following methods: 1) completion of survey sheets by a person in charge of maternal and child health (usually, a public health nurse in the municipality); 2) a visit to the municipal government office to transcribe data (i.e., manual data collection); 3) submission of de-identified electronic datasets after information that might identify individuals, such as name and address, was removed from pre-existing files; or 4) completion of questionnaires by the parents of children who are scheduled to

undergo the 3-year-old health examinations based on the maternal and child health handbooks¹⁴ (for the survey in Sendai City only).

Previous studies have reported that children in the northeast (Tohoku) region were more likely to be overweight than those in other areas in Japan.^{15–18} Considering regional variations in physical growth, we selected preschool children residing in the other three prefectures within the Tohoku region as a control group. Tohoku University sent invitation letters to all 100 municipal governments in Aomori, Akita, and Yamagata Prefectures. If they agreed to participate in the survey, persons in charge of maternal and child health in the municipalities returned completed survey sheets.

The survey was conducted over the 3-year period from July 2012 to October 2014. We decided the timeframe for birth of our targeted children backward from when they experienced the disaster after undergoing certain health examinations. During the first year, we collected data on children who were born between March 1, 2007 and August 31, 2007 (Cohort 1). These children experienced the disaster within 6 months after undergoing their 3-year-old health examinations. During the second year, we collected data on children who were born between March 1, 2009 and August 31, 2009 (Cohort 2). These children experienced the disaster within 6 months after undergoing their 1-and-a-half-year-old examinations. Finally, during the third year, we collected data on children who were born between June 1, 2010 and April 30, 2011 (Cohort 3). These children experienced the disaster within 6 months after undergoing their 3-month-old health examinations or after birth, or who were not born yet when the disaster occurred (Fig. 1). The survey in Sendai City was conducted from April 2014 to December 2014. We collected data on children who underwent their 3-year-old health examinations during the survey period. These children were born between September 2010 and May 2011.

2.2. Survey items and measurements

The survey items included sex, birth information (date of birth, gestational age in the newborn, and supine length and weight at birth) and anthropometric measurements (length/height and weight) taken at the following four time points: 1) during the early infantile period, when children were 3–4 months of age; 2) during the late infantile period, when children were between 6 and 10 months of age; 3) at the 1-and-a-half-year-old examination; and 4) at the 3-year-old health examination. Additionally, we obtained information on their methods of nutrition (breast milk, artificial milk, or mixed milk) and head circumference during infancy (Table 1).

2.3. Ethical consideration

The survey protocol was approved by the institutional review boards of Iwate Medical University, Tohoku University, and Fukushima Medical University. The present survey was conducted in accordance with the national Ethical Guidelines for Epidemiological Research.¹⁹ We did not obtain informed consent from participants. We have publicly disclosed the information of the survey, including the significance, objectives, and methods on the Tohoku University School of Medicine website (<http://www.med.tohoku.ac.jp/public/ekigaku2013.html>).

3. Results

In total, 80 out of 127 municipalities from Iwate, Miyagi, and Fukushima Prefectures participated in the survey as follows: 30 out of 33 municipalities in Iwate Prefecture (90.9%); 19 out of 35 municipalities in Miyagi Prefecture (54.3%); and 31 out of 59 municipalities in Fukushima Prefecture (52.5%). Regarding the control group, 21 out of 100 municipalities participated in the survey as

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