

The Actual Condition of Oral Care for Patients with Intellectual Disability in Fukushima before and after the Great East Japan Earthquake Happened

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BACKGROUND : East Japan was struck by the Great East Japan Earthquake (GEJE) in 2011. The aim of this study was to determine how best to administer oral care to patients with intellectual disability (ID) by highlighting the actual condition of oral care in states of disaster.

METHODS : A questionnaire investigation was carried out in patients with ID. It was divided into three major sections of questions concerning items before and after the GEJE.

RESULTS : Ninety participants were involved in this survey. In the second major section of questions, 76% of the respondents reported not being able to use water and 93% of the respondents reported not be receiving dental support. In the third section of questions, some of the respondents desired governmental agency to provide oral care for patients with ID.

CONCLUSIONS : The governmental agencies need to provide welfare facilities with water supply and organize a system supporting oral care for unexpected disasters.

Key words : the Great East Japan Earthquake, intellectual disability, oral care, brushing, evacuation life

Background

On March 11, 2011, the East Japan was struck by a magnitude 9.0 earthquake, which is called the Great East Japan Earthquake (GEJE). The earthquake was immediately followed by a tsunami, which at its highest was estimated to be 37.9 meters tall. In addition,

critical nuclear situations developed at the Fukushima Daiichi Nuclear Power Plant, causing radiation injuries in power plant workers. The number of those killed or missing has been reported to exceed 23,000¹. Several reports have been indicated that the GEJE affected both the mental and physical conditions of its victims^{2,3}. In addition, the radiation in Fukushima Prefecture

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has been shown to affect the thyroid gland in children and may increase the risk of thyroid cancer^{4,5)}, a situation the Japanese government is closely monitoring.

However, despite the fact that patients with intellectual disability (ID) are a particular vulnerable group, there have been no reports related to oral care for this population in Japan following the GEJE. We therefore explored the types of guidelines that should be applied for patients with ID under disaster conditions by investigating the actual condition of dental therapy in Fukushima Prefecture in the wake of the GEJE.

Methods

1. Survey participants

Survey participants were ID patients who had been treated at Ohu University Dental Hospital over a two-month period (April 1 to May 31, 2014).

The Institutional Review Board approved the study (approval number in Ohu University : 96), which was conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from each subject.

2. Methods

We prepared a document for the questionnaire investigation (Table 1). It was divided into three major sections of questions concerning items before and after the GEJE happened. The first major section included questions regarding '1) Before the GEJE happened', the second included those regarding '2) In the first three months after the GEJE happened' and the third included those regarding '3) Three years after the GEJE happened'.

The first major section '①Before the GEJE happened' included the following questions: "Where did you live before the GEJE happened?", "②Had you been receiving dental treatment?", and "③Who was brushing your teeth?"

The second major section '2) In the first three months after the GEJE happened', included the following questions: "①Have you experienced evacuation life?", "②When were you able to brush your teeth as usual?", "③Please answer this question only if you answered anything but 'Soon after the GEJE happened' to the previous question -Why was there a lapse in your being able to brush your teeth after the GEJE?", "④Did you have any issues with your mouth or teeth in the first three months after the GEJE happened?", and "⑤Did you receive dental support in the first three months after the GEJE happened?".

The third major section, '3)Three years after the GEJE happened' included the following questions: "①Did you move to another place after the GEJE happened?", "②In what type of abode do you now live?", "③When did you first undergo a check-up at dental offices after the GEJE happened?", "④Why did you first receive dental treatment in Ohu University Dental Hospital again after the GEJE happened?", "⑤What motivated you to visit Ohu University Dental Hospital for a checkup after the GEJE happened?", "⑥Did you have any issues with your mouth or teeth in the three years after the GEJE happened?", "⑦Do you think that the GEJE affected the condition of the teeth and the inside of the mouth of patients with ID?", and "⑧What do you want governmental agency to do concerning Dentistry in the wake of major disasters?".

Results

1. Survey participants

Ninety participants were involved in this survey (54 male and 36 female). Questions allowed for multiple answer response concerning complications, and 115 total responses were collected.

Of these responses, 58% (67/115) were from

Table 1 Questions in questionnaire investigation

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| <p>1) Before the Great East Japan Earthquake happened</p> <p>① Where did you live before the Great East Japan Earthquake happened?</p> <p>② Had you been receiving dental treatment?</p> <p><input type="checkbox"/> No <input type="checkbox"/> I did not think that I needed dental treatment. <input type="checkbox"/> I thought that I needed dental treatment but I did not visit dental office.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> I had been attending dental office for dental treatment. <input type="checkbox"/> I had been going to dental office for a periodic dental check-up.</p> <p>③ Who was brushing your teeth?</p> <p><input type="checkbox"/> by himself/herself <input type="checkbox"/> by himself/herself with assistance <input type="checkbox"/> by assistance <input type="checkbox"/> nobody brushed</p> <p>2) In the first three months after the Great East Japan Earthquake happened</p> <p>① Have you experienced evacuation life?</p> <p><input type="checkbox"/> No <input type="checkbox"/> I have been at home. <input type="checkbox"/> I have been in institutions.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> I have experienced evacuation life in a general shelter. <input type="checkbox"/> I have experienced evacuation life in a welfare facility. <input type="checkbox"/> I have experienced evacuation life in relative's house. <input type="checkbox"/> Other ()</p> <p>② When were you able to brush your teeth as usual?</p> <p><input type="checkbox"/> Soon after the Great East Japan Earthquake happened. <input type="checkbox"/> () * days after the Great East Japan Earthquake happened. *Please describe number in ().</p> <p><input type="checkbox"/> I have not been able to brush my teeth at all since the Great East Japan Earthquake happened.</p> <p>③ Please answer this question only if you answered anything but 'Soon after the Great East Japan Earthquake happened' to the previous question -Why was there a lapse in your being able to brush your teeth after the Great East Japan Earthquake?</p> <p><input type="checkbox"/> I could not use water. <input type="checkbox"/> I did not have a toothbrush. <input type="checkbox"/> I did not have space to brush my teeth. <input type="checkbox"/> I could not brush my teeth due to emotional instability caused by stress of the Great East Japan Earthquake. <input type="checkbox"/> I did not want to brush my teeth. <input type="checkbox"/> No one cared about brushing teeth because they were busy. <input type="checkbox"/> Other ()</p> <p>④ Did you have any issues with your mouth or teeth in the first three months after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes (Multiple answers allowed)</p> <p><input type="checkbox"/> I had toothache. <input type="checkbox"/> I injured my teeth or inside mouth because I hit something with them. <input type="checkbox"/> I lost my denture. <input type="checkbox"/> I had swelling gum. <input type="checkbox"/> I worried about bad breath. <input type="checkbox"/> I had mouth ulcer. <input type="checkbox"/> Crowns or inlays loosed. <input type="checkbox"/> I could not eat anything. <input type="checkbox"/> Other ()</p> <p>⑤ Did you receive dental support in the first three months after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Supplies for oral care like toothbrush or mouthwash were provided. <input type="checkbox"/> Oral care by dentists or dental hygienists was provided in shelters or Institutions. <input type="checkbox"/> Dental treatment was provided in a traveling clinic. <input type="checkbox"/> I do not know.</p> <p>3) Three years after the Great East Japan Earthquake happened</p> <p>① Did you move to another place after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> I moved to another place in the same city. <input type="checkbox"/> I moved to another place in the same prefecture (except</p> | <p>for the former city). <input type="checkbox"/> I moved outside of Fukushima Prefecture.</p> <p>② In what type of abode do you now live?</p> <p><input type="checkbox"/> I live at home. <input type="checkbox"/> I live in a temporary house. <input type="checkbox"/> I live in Institution. <input type="checkbox"/> I live in relative's house. <input type="checkbox"/> Other ()</p> <p>③ When did you first undergo a check-up at dental office after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> Within 3 months <input type="checkbox"/> From 3 to 6 months <input type="checkbox"/> From 6 to 12 months <input type="checkbox"/> From 1 year to 2 years <input type="checkbox"/> More than 2 years</p> <p>④ Why did you first receive dental treatment at Ohu University Dental Hospital after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> I was attending Ohu University Dental Hospital before the Great East Japan Earthquake happened. <input type="checkbox"/> I was invited to go to Ohu University Dental Hospital by other dental office recommendation. <input type="checkbox"/> A dental office that I used to attend was closed by the Great East Japan Earthquake happened. <input type="checkbox"/> I wanted to see a dentist in special care in dentistry. <input type="checkbox"/> Other ()</p> <p>⑤ What motivated you to visit Ohu University Dental Hospital for a checkup after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> I wanted to resume a routine examination. <input type="checkbox"/> I wanted to resume my interrupted dental procedure. <input type="checkbox"/> I had a cavity. <input type="checkbox"/> I had swelled gum or bleeding gum. <input type="checkbox"/> I had a toothache. <input type="checkbox"/> I had much tartar and plaque. <input type="checkbox"/> Other ()</p> <p>⑥ Did you have any issues with your mouth or teeth in the three years after the Great East Japan Earthquake happened?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes (Multiple answers allowed)</p> <p><input type="checkbox"/> My emotion was not stable. <input type="checkbox"/> It was difficult to arrange an assistance to help me. <input type="checkbox"/> I could not use the same transportation as before. <input type="checkbox"/> It took more time to come to Ohu University Dental Hospital than before. <input type="checkbox"/> I had to spend more money to come to Ohu University Dental Hospital than before. <input type="checkbox"/> Other ()</p> <p>⑦ Do you think that the Great East Japan Earthquake affected the condition of the teeth and the inside of the mouth of patients with ID? (Multiple answers allowed)</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes (Multiple answers allowed)</p> <p><input type="checkbox"/> An unbalanced diet in irregular evacuation life affected. <input type="checkbox"/> No brushing teeth for a long time affected. <input type="checkbox"/> No assistance who could help patients with ID affected. <input type="checkbox"/> A nearby dental office was closed. <input type="checkbox"/> It was difficult to come to Ohu University Dental Hospital. <input type="checkbox"/> Other ()</p> <p>⑧ What do you want governmental agency to do concerning dentistry in the wake of major disasters? (Multiple answers allowed)</p> <p><input type="checkbox"/> We want governmental agency to improve the environment that dental staffs can brush our teeth in a shelter. <input type="checkbox"/> We want governmental agency to provide oral care for patients with ID in a shelter. <input type="checkbox"/> We want governmental agency to provide meal assistance for patients with ID in a welfare facility. <input type="checkbox"/> We want governmental agency to construct an inquiry counter for oral care in an evacuation area. <input type="checkbox"/> We want governmental agency to provide dental treatment in a travelling clinic. <input type="checkbox"/> We want governmental agency to support oral care in cooperation with social welfare service. <input type="checkbox"/> Other () <input type="checkbox"/> Nothing in particular</p> |
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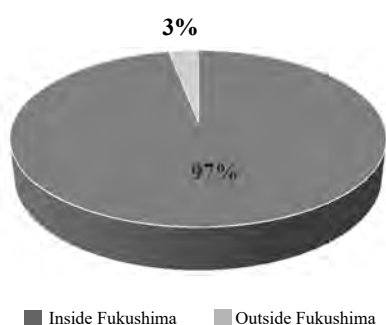


Fig. 1 1)- ① Where did you live before the Great East Japan Earthquake happened?
Most of survey participants lived inside Fukushima Prefecture before the Great East Japan Earthquake.

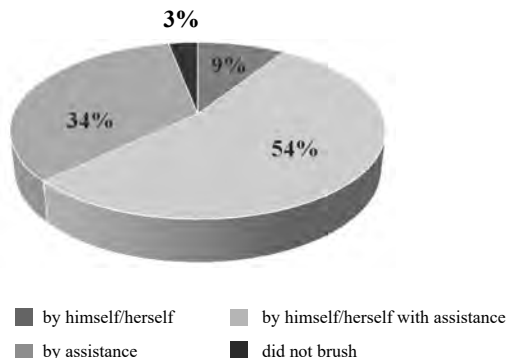


Fig. 3 1)- ③ Who was brushing your teeth?
Assistances helped most of survey participants when they brushed before the Great East Japan Earthquake.

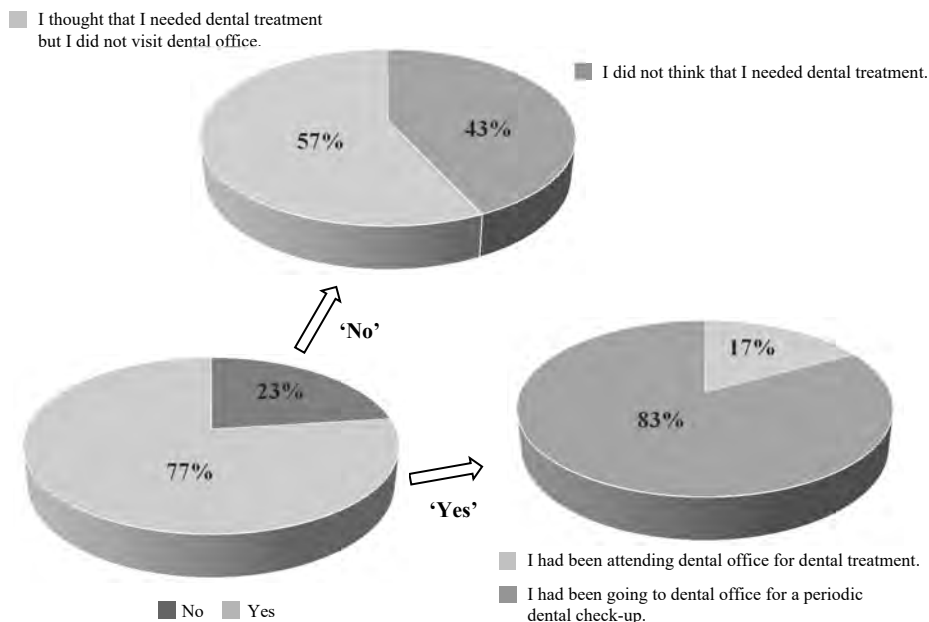


Fig. 2 1) - ② Had you been receiving dental treatment?
77% (69/90) of survey participants had been receiving dental treatment. However 23% (21/90) of them had not been receiving dental treatment. Survey participants who replied 'I did not think that I needed dental treatment.' were 43% (9/21). Also, survey participants who replied 'I thought that I needed dental treatment but I did not visit dental office.' were 57% (12/21) .

patients with epilepsy or patients given antiepileptic drugs (these patients took antiepileptic drugs prophylactically), 7% (8/115) were from patients with physical disability, 23% (26/115) were from patients with autism, 4% (5/115) were from patients with psychiatric disorder and 8%

(9/115) were from patients with other disorder.

2. Questions in questionnaire investigation (Table 1)

1) Before the GEJE happened

① Where did you live before the GEJE happened? (Fig. 1)

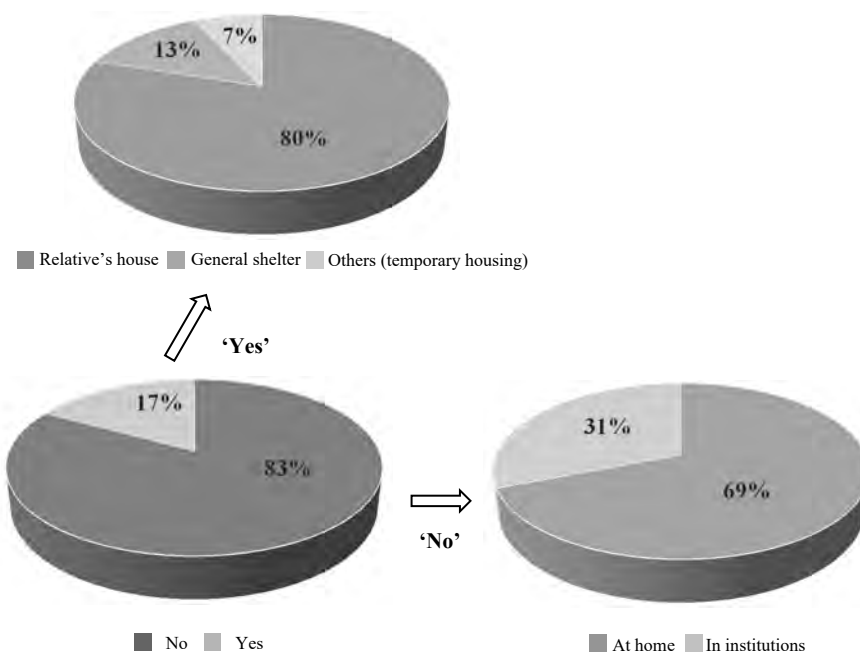


Fig. 4 2)- ① Have you experienced evacuation life?

83% (75/90) of survey participants have not experienced evacuation life. Most of them were at home. On the other hand, 17% (15/90) of survey participants have experienced evacuation life. They have experienced evacuation in relative's house, a general shelter and a welfare facility.

A total of 97% (87/90) of survey participants lived inside Fukushima Prefecture before the GEJE, while 3% (3/90) lived outside the prefecture.

② Had you been receiving dental treatment? (Fig. 2)

A total of 23% (21/90) of survey participants had not been receiving such dental treatment. Of these 23% (21/90), those who clarified as their reasoning, 'I did not think that I needed dental treatment' accounted for 43% (9/21), while those who said, 'I thought that I needed dental treatment but I did not visit dental office' accounted for 57% (12/21).

Regarding the 77% (69/90) of survey participants who had been receiving such dental treatment, those who clarified as their reasoning, 'I had been attending dental office for dental treatment' accounted for 17% (12/69), while those who said,

'I had been going to dental office for a periodic dental check-up' accounted for 83% (57/69).

③ Who was brushing your teeth? (Fig. 3)

A total of 9% (8/90) of respondents claimed they brushed their own teeth independently, while 54% (49/90) brushed with assistance. 34% (30/90) had others brush for them, and 3% (3/90) did not brush.

2) In the first three months after the GEJE happened

① Have you experienced evacuation life? (Fig. 4)

A total of 83% (75/90) had never experienced evacuation life. Of these 83% (75/90), those who clarified as their reasoning, 'I remained at home' account for 69% (52/75), while those who said, 'I was in an institution' accounted for 31% (23/75).

Of the 17% (15/90) who had experienced evacuation life, those who had clarified as their

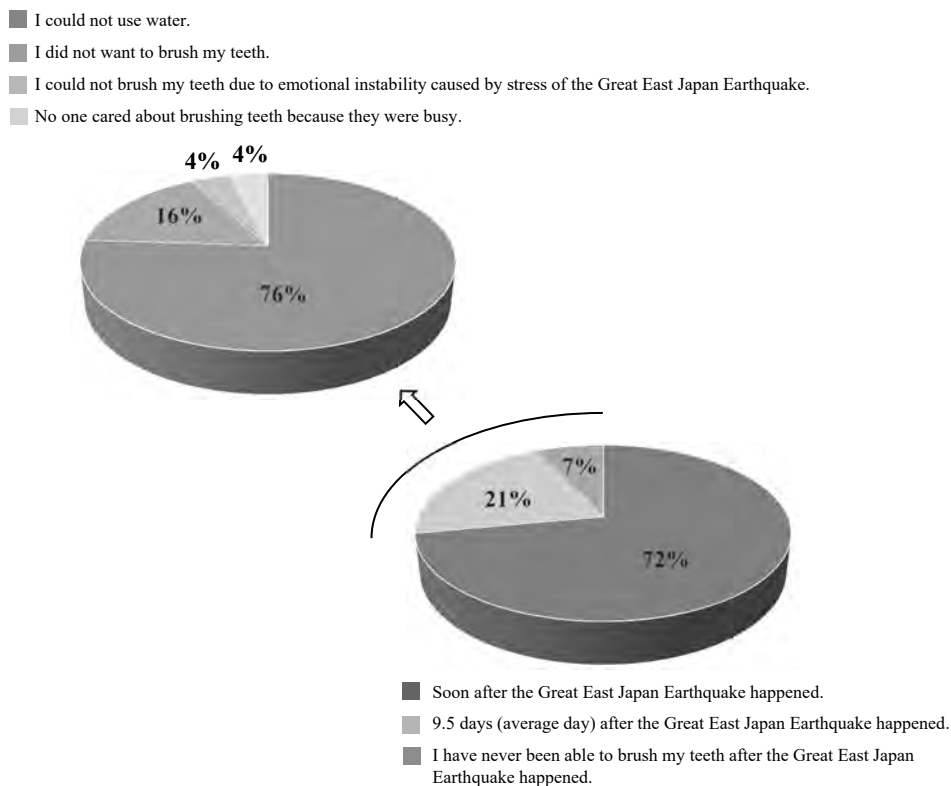


Fig. 5 2)- ② When were you able to brush your teeth as usual? and 2)- ③ Please answer this question only if you answered anything but 'Soon after the Great East Japan Earthquake happened' to the previous question – Why was there a lapse in your being able to brush your teeth after the Great East Japan Earthquake?

72% (65/90) of survey participants were able to brush their teeth as usually soon after the Great East Japan Earthquake happened. The rest of them who answered except for 'Soon after the Great East Japan Earthquake happened' did not brush their teeth soon after the Great East Japan Earthquake happened, because 76% (19/25) of them could not use water.

reasoning, 'I have experienced evacuation life in a general shelter' account for 13% (2/15), none said 'I have experienced evacuation life in a welfare facility', 74% (12/15) said, 'I have experienced evacuation life in relative's house', and 7% (1/15) reported 'Other' experience (this patient was evacuated to temporary housing).

②When were you able to brush your teeth as usual? (Fig. 5)

A total of 72% (65/90) of survey participants reported that they were able to resume a normal brushing scheduled soon after the GEJE. A total of 21% (19/90) of survey participants reported being able to start brushing an average of 9.5

days after the GEJE, and 7% (6/90) of survey participants replied, 'I have not been able to brush my teeth at all since the GEJE happened'.

③Please answer this question only if you answered anything but 'Soon after the GEJE happened' to the previous question –Why was there a lapse in your being able to brush your teeth after the GEJE? (Fig. 5)

In their response to question 3, 76% (19/25) of survey participants replied 'I could not use water', 16% (4/25) said 'I did not want to brush my teeth', 4% (1/25) said, 'I could not brush my teeth due to emotional instability caused by stress of the Great East Japan Earthquake',

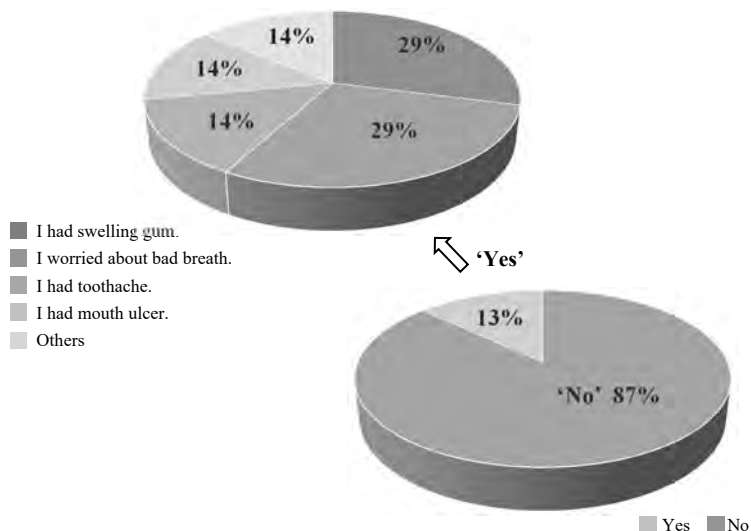


Fig. 6 2)- ④ Did you have any issues with your mouth or teeth in the first three months after the Great East Japan Earthquake happened?

87% (78/90) of survey participants have not had any troubles in their mouths and teeth for three months after the Great East Japan Earthquake happened, however 13% (12/90) of them have had some troubles. In whom have had troubles, the most common answers were two items. One was 'I had swelling gum.' the other was 'I worried about bad breath.'

and 4% (1/25) said, 'No one cared about brushing their teeth because they were so busy'.

④ Did you have any issues with your mouth or teeth in the first three months after the GEJE happened? (Fig. 6)

A total of 87% (78/90) of survey participants reported no oral issues in the first three months following GEJE. Among of 13% (12/90) who did report such issues in this time frame, responses included the following (multiple responses allowed) : swollen gums in 29% (4/14), bad breath in 29% (4/14), toothache in 14% (2/14), oral ulcer in 14% (2/14), and other issues in 14% (2/14) (details: 'I could not go to dental office for a periodic dental check-up' and 'I could not receive dental treatment under general anesthesia').

⑤ Did you receive dental support in the first three months after the GEJE happened? (Fig. 7)

A total of 93% (84/90) of survey participants reported not receiving any dental support in the first three months after the GEJE, while 7%

(6/90) did receive such treatment. Among these 7% (6/90), 83% (5/6) reported receiving supplies for oral care such as toothbrushes or mouthwash, and 17% (1/6) reported receiving oral care from dentists or dental hygienists at shelters or institutions.

3) Three years after the GEJE happened

① Did you move to another place after the GEJE happened? (Fig. 8)

A total of 90% (87/90) of survey participants reported not moving after the GEJE, while 10% (9/90) did move. Among these 10% (9/90), 67% (6/9) moved to another place in the same city, and 33% (3/9) moved to another place in the same prefecture. None moved outside of Fukushima Prefecture.

② In what type of abode do you now live? (Fig. 9)

A total of 67% (60/90) of survey participants reported living in their own home, 1% (1/90) reported living in temporary housing. 29% (26/90) reported living in a relative's house.

- Supplies for dental care like toothbrush or mouthwash were provided.
- Dental care by dentists or dental hygienists was provided in shelters or Institutions.

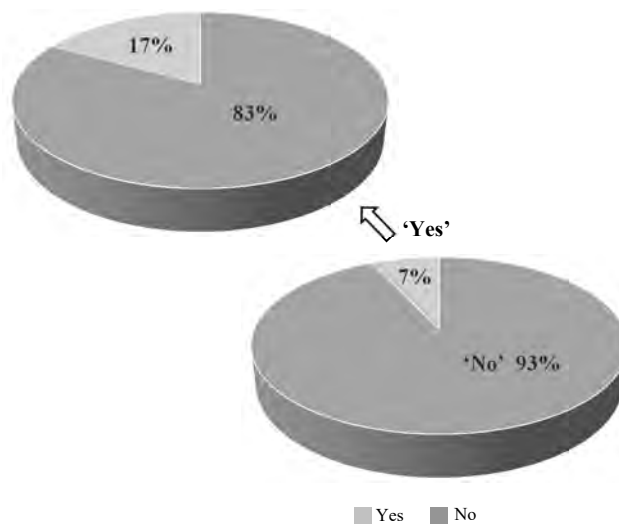


Fig. 7 2)- ⑤ Did you receive dental support in the first three months after the Great East Japan Earthquake happened? 93% (84/90) of survey participants have not received dental supports for three months after the Great East Japan Earthquake happened. However 7% (6/90) of them have received supports.

- I moved to another place in the same city.
- I moved to another place in the same prefecture.

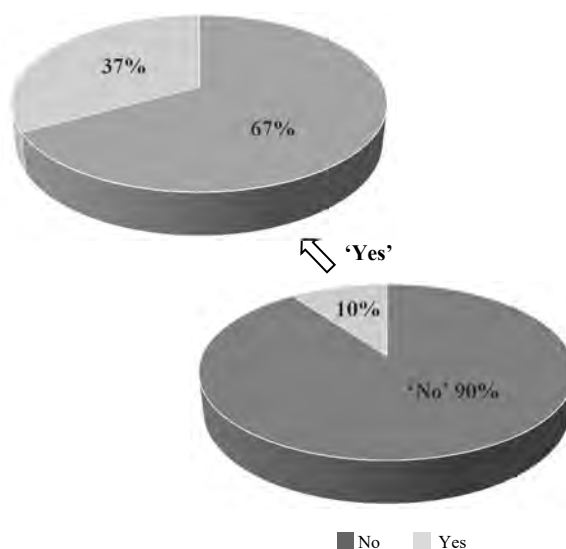


Fig. 8 3)- ① Did you move to another place after the Great East Japan Earthquake happened?

90% (87/90) of survey participants did not move to another place after the Great East Japan Earthquake happened.

③ When did you first undergo a check-up at dental office after the GEJE happened? (Fig. 10)

A total of 16% (14/90) of survey participants first underwent a check-up at Ohu University

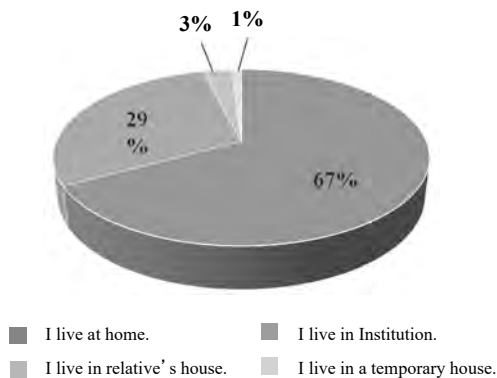


Fig. 9 3)- ② In what type of abode do you now live?
 67% (60/90) of survey participants live at home three years later after the Great East Japan Earthquake happened. The second most number of answer was 'I live in Institution.'

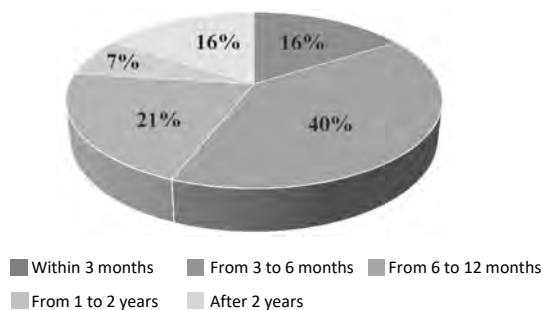


Fig. 10 3)- ③ When did you first undergo a check-up at dental office after the Great East Japan Earthquake happened?
 The most common answer was 'From 3 months later to 6 months later'. 40% (37/90) of survey participants got a check-up at Ohu University Dental Hospital from 3 months later to 6 months later after the Great East Japan Earthquake happened.

Dental Hospital within 3 months after the GEJE, 40% (37/90) did so 3-6 months after the GEJE, 21% (19/90) did so 6-12 months after the GEJE, 7% (8/90) did so 1-2 years after the GEJE, and 16% (14/90) did so more than 2 years after the GEJE.

④ Why did you first receive dental treatment at Ohu University Dental Hospital after the GEJE happened? (Fig. 11)

In response to Question 4, 75% (67/90) of survey

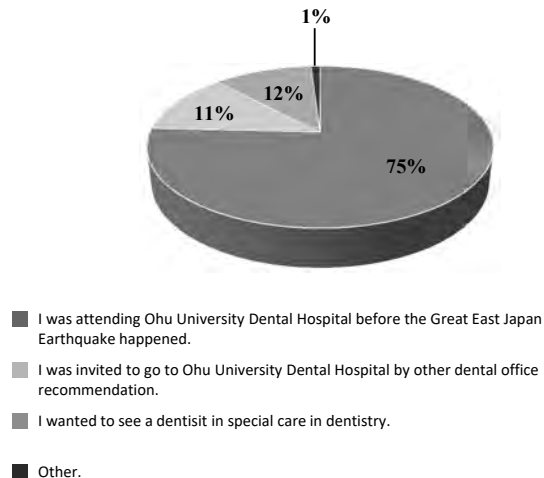


Fig. 11 3)- ④ Why did you first receive dental treatment in Ohu University Dental Hospital again after the Great East Japan Earthquake happened?
 The most common reason was that 75% (67/90) of survey participants was attending Ohu University Dental Hospital before the Great East Japan Earthquake happened.

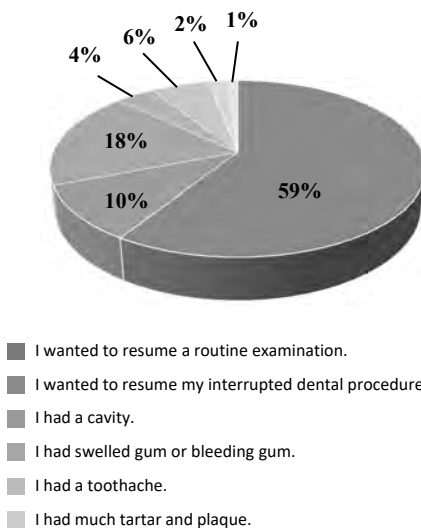


Fig. 12 3)- ⑤ What motivated you to visit Ohu University Dental Hospital for a checkup after the Great East Japan Earthquake happened?
 The most common motivation was to want to resume a routine examination after the Great East Japan Earthquake happened.

participants reported that they had already been attending Ohu University Dental Hospital before

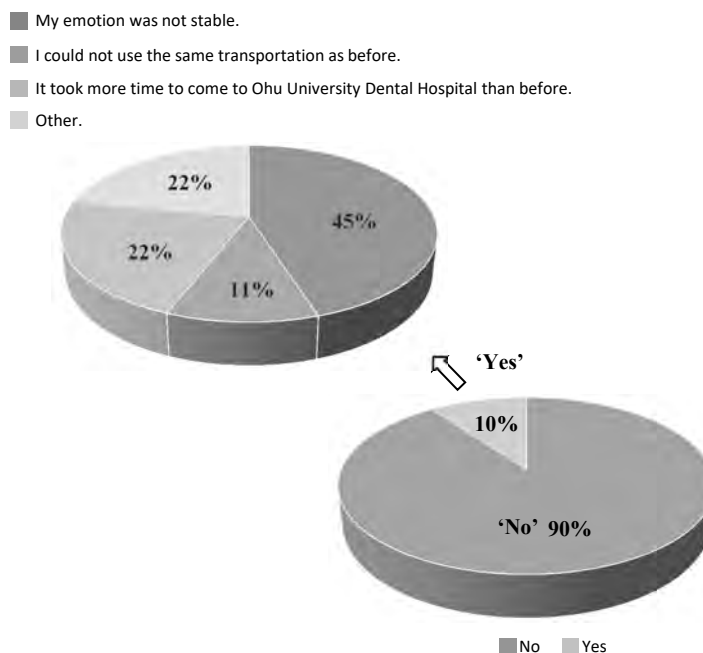


Fig. 13 3)- ⑥ Did you have any issues with your mouth or teeth in the three years after the Great East Japan Earthquake happened?

90% (81/90) of survey participants have not had any troubles to visit Ohu University Dental Hospital for three years after the Great East Japan Earthquake happened. However 10% (9/90) of them have had some troubles. As the most common reason in answers replied 'No' was that their emotion were not stable.

the GEJE happened, 11% (10/90) had been referred another dental office, 12% (12/90) wanted to see a dentist in special care in dentistry, and 1% (1/90) had other reasons (for this patient, an institute assistant recommended he undergo a check-up at Ohu University Dental Hospital).

⑤ What motivated you to visit Ohu University Dental Hospital for a checkup after the GEJE happened? (Fig. 12)

In response to Question 5, 59% (53/90) of survey participants expressed a desire to resume routine examinations, 10% (9/90) expressed a desire to resume interrupted dental procedures, 18% (16/90) visited for caries treatment, 4% (4/90) visited for swollen or bleeding gums, 6% (5/90) visited for a toothache, 2% (2/90) visit for tartar and plaque, and 1% (1/90) had other reasons (this patient wanted to have a primary tooth extracted because it had erupted into his gingiva).

⑥ Did you have any issues with your mouth or teeth in the three years after the GEJE happened?" (Fig. 13)

A total of 90% (81/90) of survey participants reported no issues with their mouth or teeth in the three years after the GEJE, while 10% (9/90) did suffer from such issues. 10% (9/90) of survey participants, replied 'Yes' in response to Question 6, were asked 'What kinds of troubles did you have in the three years after the GEJE happened?'. Among those 10%, reported reason included (multiple responses allowed) unstable emotions in 45% (4/9), an inability to use the same transportation as before in 11% (1/9), taking more time to reach Ohu University Dental Hospital than before the GEJE in 22% (2/9), and other reasons in 22% (2/9) ('other' responses included "It was difficult to accompany patients to the hospital because their guardians were

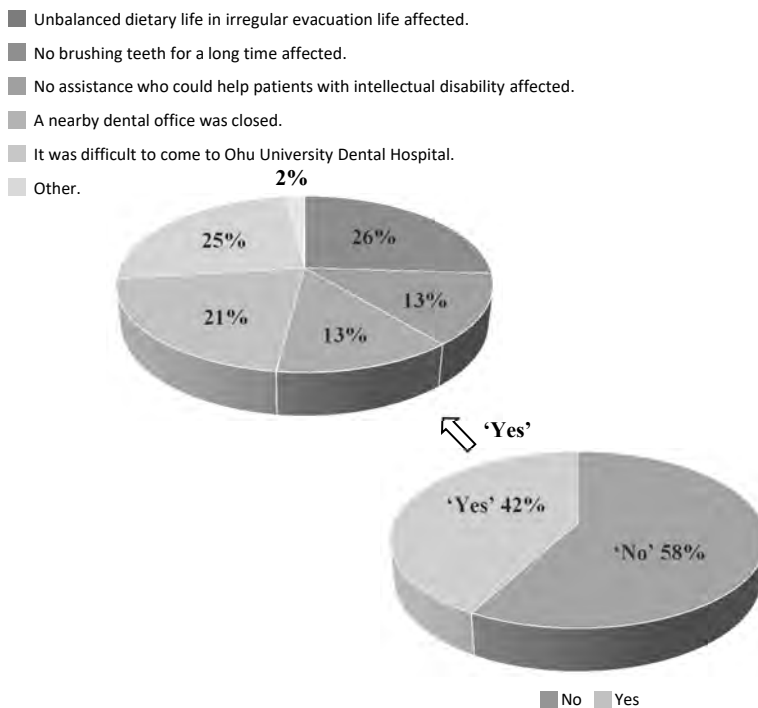


Fig. 14 3)- ⑦ Do you think that the Great East Japan Earthquake affected the condition of the teeth and the inside of the mouth of patents with ID? (Multiple answers allowed)

Approximately half of survey participants replied 'No'. In answers replied 'Yes', the most common reason was that their unbalanced dietary life in irregular evacuation life affected. The second common reason was to be difficult to come to Ohu University Dental Hospital after the Great East Japan Earthquake.

busier to make a living than before the GEJE).

⑦ Do you think that the GEJE affected the condition of the teeth and the inside of the mouth of patients with ID? (If yes, please cite your reasoning; multiple responses allowed) (Fig. 14)

A total of 58% (52/90) of survey participants did not believe that the GEJE affected the condition of the teeth and inside of the mouth of patients with ID, while 42% (38/90) of survey participants did believe that the GEJE affected these patients in this manner. Among those 42%, reported reasons included (multiple responses allowed; total of 61 obtained) an imbalance in the diet due to living through an evacuation in 26% (16/61), not brushing the teeth for long time in 13% (8/61), a lack of assistants able to help

patients with ID affected by the GEJE in 13% (8/61), nearby dental offices closed in 21% (13/61), visiting Ohu University Dental Hospital difficult in 25% (15/61), and other reasons in 2% (1/61) (specifically, a check-up was postponed due to the GEJE).

⑧ What do you want governmental agency to do concerning Dentistry in the wake of major disasters? (multiple responses allowed) (Fig. 15)

A total of 19% (42/222) of survey participants wanted governmental agency to improve the evacuation environment to facilitate brushing teeth in shelters, 20% (45/222) wanted governmental agency to provide oral care for patients with ID in shelters, 18% (39/222) wanted governmental agency to provide meal assistance to patients with ID in welfare facilities, 8% (39/222) wanted

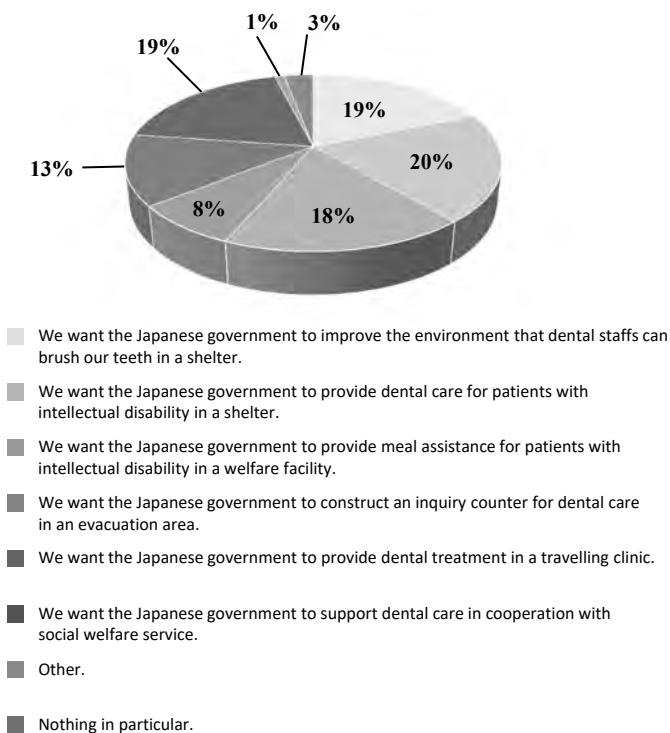


Fig. 15 3)- ⑧ What do you want the Japanese government to do concerning dentistry in the wake of major disasters?

In this question allowed multiple answers, the most common request was that Japanese government provided dental care for patients with ID in a shelter.

governmental agency to construct an inquiry counter for oral care in evacuation areas, 13% (29/222) wanted governmental agency to provide dental treatment via travelling clinics, 19% (41/222) wanted governmental agency to support oral care in cooperation with social welfare services, and 1% (2/222) had other ideas (specifically, a desire for governmental agency to provide tooth brushes and a desire for governmental agency to provide oral care services at home). A total of 3% (6/222) had no particular desires of governmental agency on this point.

Discussion

1. Relocation and changes in patient's living environment before and after the GEJE

All subjects were adversely affected by GEJE to some degree, as 97% of respondents had been

living in Fukushima Prefecture when the GEJE happened, while 3% had been living in neighboring prefecture, all of which suffered tsunami damage and radiation effects from the nearby Fukushima Daiichi Nuclear Plant.

In Question 2)-① (Fig.4), 17% (15/90) of patients reported experiencing evacuation life and had been unable to stay at welfare facilities in the first three months after the GEJE. As a result, most of them had been living in a relative's house. In short, people with ID had difficulty obtaining residence in a general shelter, because members of the general population had difficulty understanding their actions, thoughts and behavior^{6,7)}. This is guessed that guardians of patients with ID would not like to bother them and make them uncomfortable to live in a general shelter with them.

In Question 3)-① (Fig. 8), by three years after the GEJE, 90% (81/90) of patients had not moved anywhere, possibly due to expected difficulty acclimating to a new environment⁸⁾. Their guardians understand situations that they must overcome a lot of difficulties in their new address. Therefore the governmental agency needs to build public institutions which are used as both a welfare facility and a general shelter in the disaster setting.

2. Need for dental treatment

A total of 77% (69/90) of patients had undergone dental treatment before the GEJE (Fig. 2), while 23% (21/90) had not undergone such treatment. Furthermore, more than half in 23% (21/90) of the patients needed dental treatment though they did not see dental office before the GEJE happened. The present results indicated that most patients with ID needed dental treatment after the GEJE happened, and approximately 90% of patients needed dental treatment in their everyday life. Therefore, it is imperative that patients with ID are cared and receive daily treatment in order to prevent caries and periodontal diseases, even in the event of natural disasters.

3. Brushing teeth before and after the GEJE

A total of 72% (65/90) of patients resumed brushing immediately after the GEJE, according to Question 2)-② (Fig. 5), although 97% (87/90) had reported brushing by themselves or with aid before the GEJE (Question 1)-③ : Fig. 3). Nevertheless, despite such prompt resumption in a large proportion of respondents, 29% (4/14) of patients reported gum swelling, and 29% (4/14) reported bad breath at three months after the GEJE according to Question 2)-④ (Fig. 6). Reasons for this outcome may be that their teeth were not being brushed by their helpers or staff members, they could not use water freely (possibly because they were unfit to live in general shelter), or they lacked the necessary

tools for brushing teeth. This means that their oral cavity results in a lack of self-cleaning due to drying, which can simultaneously trigger the occurrence of periodontal disease⁹⁾. From the viewpoint of periodontal disease, they share common inflammatory risk factors with other systemic and chronic inflammatory disorders¹⁰⁾. In addition, the nutritional status is worse than usual in the state the disasters setting, and periodontal disease may worsen the nutritional status due to the associated eating disorder¹¹⁾.

Therefore, during disasters, welfare facilities should be equipped with an adequate water supply and tooth brushes to facilitate brushing for patients with ID. According to the questionnaire, our results of the questionnaire showed that a ratio of patients supplied dental support was 7% (6/90) for three months after the GEJE (Fig. 7), and the rate was very low. These results meant that a welfare facility, was equipped with water system for patients with ID, was needed to support dental care and brushing in the state of disaster.

4. First treatment in a dental office after the GEJE

A total of 16% (14/90) of patients resumed regular treatment in a dental office within 3 months after the GEJE, and 40% (37/90) resumed treatment within 3-6 months after the GEJE (Fig. 10). This indicated that it took a relatively long time for treatment at dental offices to be resumed after the GEJE. This delay may be attributed to the delayed restoration of dental office and hospitals due to the earthquake. Given these finding, under such conditions, dental treatment for patients with ID should be performed in locations other than merely dental offices and hospitals. Furthermore, as one of the strategies for visiting care support system, a dental hospital would need to provide not only uninterrupted care for dental emergencies but also a mobile dental system using a trailer or

truck^{12,13)}. Thus, the governmental agencies in each country need to legally organize a visiting care support system to facilitate visiting dental care by dentists in order to improve the efficiency of the link between care service providers, hospitals and doctors.

A total of 75% (67/90) of patients with ID resumed dental treatment at Ohu University Dental Hospital after the GEJE happened (Fig. 11). This motivation to be treated at our hospital was to resume a routine examination. Our results suggested that a routine examination motivated them to come to our hospital, to evoke brushing teeth and to keep their mouth clean in their daily life. Routine examinations are important opportunities to remind patients about oral care and encourage their continued oral care. From the viewpoint of the ratio in the motivation to come to our hospital after the GEJE, our hospital should have supported and helped dental care for patients with ID immediately after the GEJE.

5. Future issues

A total of 7% (6/90) of patients with ID received dental support in the first three months after the GEJE happened, meaning that the vast majority of ID patients did not receive dental support in the early period after this disaster. In addition, more than half of patients' guardians thought that the GEJE had affected the patient's oral health, likely due to irregular eating patterns under evacuation conditions, difficulty visiting a dentist, dental offices being closed, and no staff in attendance to brush their teeth. Patients who participated in the present study expressed a desire for dental staff to understand patients with ID and perform oral care in these patients during major disasters and for an environment in which dental staff could brush ID patients' teeth in shelters. These results indicate that patients with ID need some welfare facilities supporting oral care and food,

which are able to supply water and to live in space for them.

Conclusion

In the wake of major disasters, patients with ID require a basic water supply for teeth brushing, supportive oral care, and an environment equipped with expert staff. In preparation for disasters like the GEJE, governmental agencies in each country should prepare welfare facilities for such vulnerable individuals and to organize a system to support them, particularly with regard to their dental needs.

Author statement

No conflicts of interest have been declared.

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