

Intention to return in residents of Okuma and its characteristics: the evacuation order was lifted eight years after the Fukushima Daiichi Nuclear Power Station accident

Hitomi Matsunaga*, Makiko Orita, Keiko Oishi, Yasuyuki Taira and Noboru Takamura

Department of Global Health, Medicine and Welfare, Atomic Bomb Disease Institute, Nagasaki University, 1-12-4 Sakamoto, Nagasaki 8528523, Japan

*Corresponding author. Department of Global Health, Medicine and Welfare, Atomic Bomb Disease Institute, Nagasaki University, 1-12-4 Sakamoto, Nagasaki 8528523, Japan. Tel: +81-95-819-7171; Fax: +81-95-819-7172; E-mail: hmatsu@nagasaki-u.ac.jp

(Received 13 May 2021; revised 26 May 2021; editorial decision 3 June 2021)

To the Editor,

Ten years have passed since the accident at the Fukushima Daiichi Nuclear Power Station (FDNPS) [1]. Okuma is one of the towns where the FDNPS is located, and its evacuation order was lifted in 2019, eight years after the accident.

The rate of return to Kawauchi, a village in the Fukushima Prefecture where the return began in 2012, about two years after the accident was higher than 80%. In comparison, the return rate in Okuma, where the return began in 2019, was about 3% as of early 2021 [2,3].

From December 2020 to January 2021, we conducted a questionnaire survey of residents on their intention to return (ITR) to Okuma in the second year after the evacuation order had been lifted. With the cooperation of Okuma's town office, the survey was distributed to approximately 5000 residents, who were the Okuma town resident card holders in April 2020. The study protocol was approved by the ethics committee of Nagasaki University Graduate School of Biomedical Sciences (No.20060103-2).

Of 1134 respondents, those who had returned home (Group 1) accounted for 3.4% (38) of people, those who wanted to return (Group 2) accounted for 9.8% (111) of people, those who could not decide whether to return (Group 3) accounted for 24.3% (276) of people and those who had decided not to return (Group 4) accounted for 62.5% (709) of people.

The characteristics of each group were analyzed using the chi-squared test. In Group 1, the percentage of people who lived alone was higher than that in the other groups (36.8%, $p < 0.01$). In Group 2, the percentages of older people aged 60 years and over (72.1%, $p < 0.01$) and of people who were born in Okuma (66.7%, $p < 0.01$) were higher than those in the other groups. In Group 3, there were higher percentages of people with children aged 18 years or younger

(22.1%, $p = 0.03$), with high levels of anxiety about the effects of radiation from the FDNPS accident on their health (64.1%, $p < 0.01$), and with concerns about the health effects on their descendants (64.9%, $p < 0.01$). Finally, in Group 4, the percentages of people with anxiety toward the consumption of foods (59.7%, $p < 0.01$) and tap water in Okuma (68.8%, $p < 0.01$) were significantly higher than those in the other groups.

No differences between sexes in each group of ITR were found ($p = 0.86$), those who did physical activity for more than 1 hour per day ($p = 0.28$), or those who felt that life was worth living ($p = 0.67$) (see Table 1).

The results of a logistic regression analysis showed that, compared with Group 4, Groups 2 and 3 had lower levels of awareness about a consultation service on radiation in Okuma and that their desire to consult experts on radiation and its health effects had an independent effect on their ITR (Table 2). Thus, while people considering a return to Okuma, such as those in Groups 2 and 3, wanted to consult experts on radiation and its health effects, our findings showed that they tended not to know about the consultation service.

A previous study reported that there are likely to be almost no health effects from the FDNPS accident [4]. However, similar to our earlier work, the present study showed that concerns about health effects from the accident had negative effects on the ITR of residents [5].

About 30% of the respondents to this study (Groups 2 and 3) were thinking about a return to Okuma. Therefore, the creation of an environment in which these residents can access consultation services on radiation and its health effects is an urgent issue. Similar to the results of a previous study, our findings also demonstrated a greater tendency for older people to want to return compared with younger

Table 1. Demographic characteristics, psychological status, and perception of the effects of radiation exposure on health by group

Items	Unit	Group 1 n = 38	Group 2 n = 111	Group 3 n = 276	Group 4 n = 709	p
Sex	Male	24 (63.2%)	59 (53.2%)	143 (51.8%)	329 (46.4%)	0.86
Age (years)	≥ 60	25 (65.8%)	80 (72.1%)	157 (56.9%)	475 (67.0%)	< 0.01
Living with children aged < 18 years	Yes	3 (7.9%)	13 (11.7%)	61 (22.1%)	138 (19.5%)	0.03
Living alone	Yes	14 (36.8%)	30 (27.0%)	58 (21.0%)	102 (14.4%)	< 0.01
Born in Okuma town	Yes	23 (60.5%)	74 (66.7%)	165 (56.9%)	355 (50.1%)	< 0.01
Physical activity for more than one hour a day	Yes	20 (52.6%)	60 (54.1%)	146 (56.9%)	419 (59.1%)	0.28
Life is worth living	Yes	27 (71.1%)	69 (62.2%)	177 (56.9%)	471 (66.4%)	0.67
Reluctance to consume foods from Okuma	Yes	8 (21.1%)	47 (42.3%)	158 (56.9%)	423 (59.7%)	< 0.01
Reluctance to drink tap water from Okuma	Yes	7 (18.7%)	57 (51.4%)	177 (64.1%)	488 (68.8%)	< 0.01
Belief that living in Okuma will be associated with health effects from radiation	Yes	9 (23.7%)	43 (38.7%)	177 (64.1%)	413 (58.3%)	< 0.01
Belief that genetic effects will appear in the next generation	Yes	11 (28.9%)	53 (47.7%)	179 (64.9%)	417 (58.8%)	< 0.01
Recognition of consultation services with radiation experts	Yes	29 (76.3%)	41 (36.9%)	111 (40.2%)	343 (48.4%)	0.01
Consultation requests with radiation experts	Yes	15 (39.5%)	50 (45.0%)	117 (42.4%)	141 (19.1%)	< 0.01

Note. The chi-squared test was used for analysis. Group 1 had already returned home, Group 2 wished to return home, Group 3 was unsure about whether to return home, and Group 4 had decided not to return home.

Table 2. Logistic regression analyses of Group 2 vs Group 4 and Group 3 vs Group 4

Items	Unit	Group 2 (ref.) vs Group 4		Group 3 (ref.) vs Group 4	
		OR	95%CI	OR	95%CI
Age (years)	< 60/≥ 60	0.8	0.5–1.3	1.6**	1.2–2.1
Born in Okuma town	Yes/No	1.9**	1.2–3.0	1.5**	1.1–2.0
Reluctance to consume foods from Okuma	Yes/No	0.7	0.4–1.1	0.6**	0.4–0.9
Belief that living in Okuma will be associated with health effects from radiation	Yes/No	0.4**	0.2–0.7	1.4	0.9–2.0
Recognition of consultation services with radiation experts	Yes/No	0.5**	0.3–0.8	0.7*	0.5–0.9
Consultation requests with radiation experts	Yes/No	4.6**	2.9–7.2	3.2**	2.3–4.3

Note. OR; odds ratio, CI; confidence interval. Group 2 wished to return home, Group 3 was unsure about whether to return home, and Group 4 had decided not to return home.

*p < 0.05.

**p < 0.01.

people [5]. In systems that make it possible for the residents who want to return to do so, enhancements are needed to support systems for all aspects of daily living so that people can return regardless their age or degree of interdependent in their life.

ACKNOWLEDGMENTS

The authors would like to thank all study participants and Okuma town staffs.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

FUNDING

This work was supported by Research on the Health Effects of Radiation organized by Ministry of the Environment, Japan.

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