Radiation Exposure and Thyroid Cancer in Children and Adolescents Following a Nuclear Power Plant Accident: The Fukushima Health Management Survey

P3-D7

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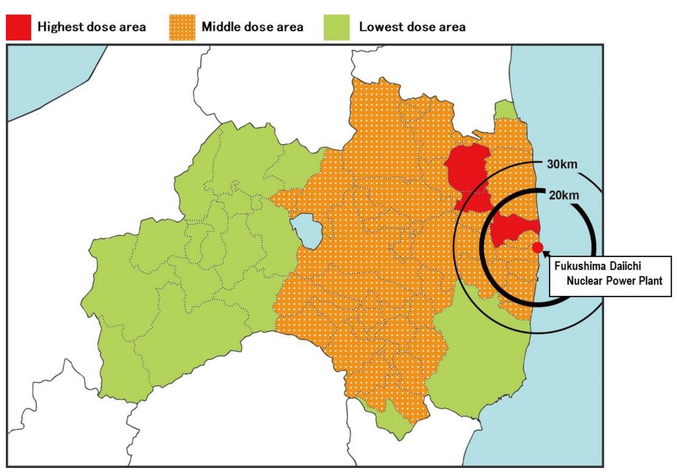
In the 11 years after the radiation accident, no clear association was found between individual thyroid equivalent dose and thyroid cancer or suspected thyroid cancer on the thyroid ultrasound examination in Fukushima Prefecture.

BACKGROUND

Following the Fukushima Daiichi Nuclear Power Plant accident that occurred after the Great East Japan Earthquake on March 11, 2011, Fukushima Prefecture initiated thyroid ultrasound examinations for residents aged 18 years or younger as a part of the Fukushima Health Management Survey after the accident. We have examined the association between individual external radiation doses and thyroid cancer and reported that no significant association was found,[1-3] although the association between individual internal radiation doses and thyroid cancer was not clear. Therefore, the aim of this study was to examine the association between thyroid cancer and internal and external radiation dose assessed from behavioral records in a cohort-based case-control study.

METHODS

Participants were residents of Fukushima Prefecture aged 18 years or younger at the time of the disaster. 300,472 (1st round), 270,552 (2nd round), 217,922 (3rd round), and 183,410 (4th round) participants underwent primary thyroid ultrasound examination by the end of June 2022, respectively. Of these, 132 were selected as a case group from those who underwent secondary examination according to the criteria for thyroid nodules and cysts and were identified as malignant or suspected malignant, and whose behavioral records were obtained through the "Basic Survey" of the survey. In addition, 22 individuals (not identified by thyroid examination) whose year of diagnosis was between 2012 and 2018, obtained from the cancer registry, were selected as the case group, for a total of 154 individuals. Controls were randomly selected in a ratio of 1:3 (cases: controls) by matching cases for sex, year of birth, and year of primary examination. The internal and external exposure doses calculated from the behavioral records were used as individual exposure doses, and the association of the exposure doses with thyroid cancer or suspected cases was examined by a conditional logistic analysis.



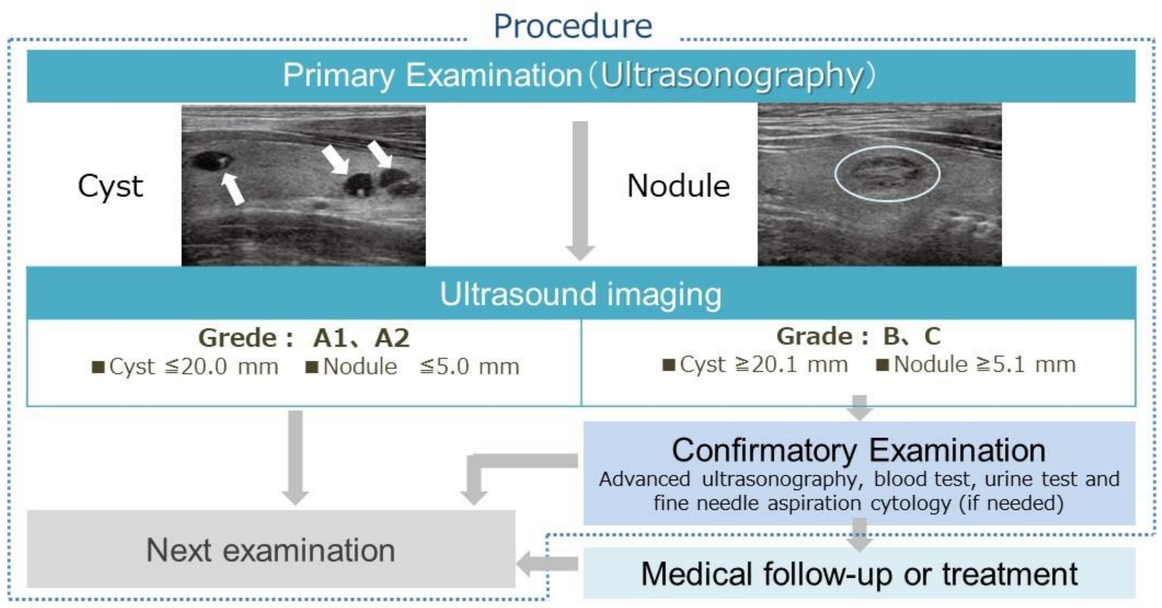


Table 1. Number of subjects, examination rates, and number of cancers detected in each thyroid examination

	1st round survey	2nd round survey	3rd round survey	4th round survey
Survey year	FY2011-FY2013	FY2014-FY2015	FY2016-FY2017	FY2018-FY2019
Those eligible for primary examination	367,637	381,237	336,667	294,228
Participation rate for primary examination	81.7%	71.0%	64.7%	62.3%
Those referred for confirmatory exam	2,293	2,230	1,502	1,394
Participation rate for confirmatory examination	92.9%	84.2%	73.5%	74.3%
Malignant or suspicious for malignancy (FNAC)	116	71	31	39

RESULTS

The odds ratios of having thyroid cancer or suspected thyroid cancer were calculated for thyroid equivalent doses (mSv) less than 3 mSv, 3-10 mSv, and 10 mSv or more. There was no significant association between thyroid equivalent dose and thyroid cancer, nor was there a dose-response association. Furthermore, the same analysis stratified by region showed no significant increase in the odds ratio for the 10 mSv or higher group.

Table 2. Characteristics of participants

	Case	Control	All
n	154	462	616
Women, n (%)	89(57.8)	267(57.8)	
Mean age at time of earthquake	13.0	13.0	13.0
Equivalent thyroid dose (mSv), median(Q1-Q3)	2.3(1.3-3.4)	2.0(1.1-3.1)	2.1(1.2-3.2)

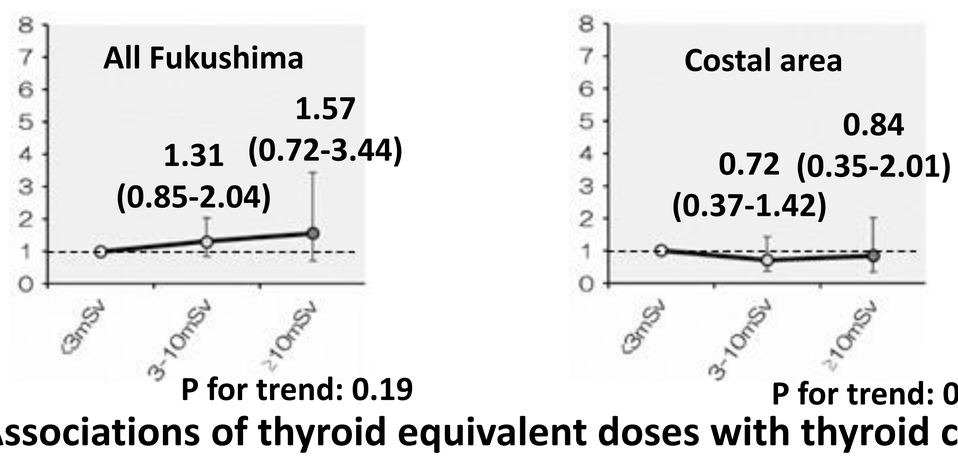


Fig. Associations of thyroid equivalent doses with thyroid cancer

CONCLUSIONS

In the 11 years after the radiation accident, no clear association was found between individual radiation dose and thyroid cancer or suspected thyroid cancer on the thyroid ultrasound examination in Fukushima Prefecture.

REFERENCES

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