Time Dependent Modifying Factors for Cancer Mortality Association with Low Dose and Low Dose-rate Exposure to Ionizing Radiation in J-EPISODE

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Background

The latest report of Japanes Epidemiological Study of Low-Dose Radiation Effects (J-EPISODE), which followded up 204,103 male nuclear workers during 1991-2010, indicated that smoking might be a strong confounder in the association with radiation and cancer mortality, and the report therefore had no clear conclusion regarding low-dose radiation risk.

Most workers have engaged in NPPs, which have been in operation since 1966. The annual exposure dose at the 95th percentile was over 10mSv/y in the 1970s, but declined sharply, to less than the natural radiation level. The dose exposed during 1970–85 largely affected the cumulative dose during the follow-up period.

Objective

The objective of the present study is to evaluate the impact of several time dependent modifying factors, such as annual exposure dose rate.

Methods

The cumulative dose was divided into several windows of the factor studied, and an additive ERR model was applied.

Results

Regarding the two windows of annual dose rate (for instance, <5 mSv/year vs. >=5 mSv/year), the ERR/Sv in relation to the cumulative dose received at <5 mSv was negative, and smaller than that received at >=5 mSv.

Conclusion

A Cumulative dose derived from an extremely low annual dose rate suggests a different dose response than that from a higher dose rate. We propose paying attention not only to cumulative doses, but also to the exposure dose rate and duration of exposure.

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